DOCUMENT RESUME

ED 414 472 CE 075 403

AUTHOR	Stasz, Cathleen; Kaganoff, Tessa
TITLE	Learning How To Learn at Work: Lessons from Three High School Programs.
INSTITUTION	National Center for Research in Vocational Education, Berkeley, CA.
SPONS AGENCY	Office of Vocational and Adult Education (ED), Washington, DC.
PUB DATE	1997-12-00
NOTE	104p.
CONTRACT	V051A30004-97A; V051A30003-97A
AVAILABLE FROM	NCRVE Materials Distribution Service, Horrabin Hall 46, Western Illinois University, Macomb, IL 61455; phone: 800-637-7652 (order no. MDS-916, $9).
PUB TYPE	Reports - Research (143)
EDRS PRICE	MF01/PC05 Plus Postage.
DESCRIPTORS	*Career Academies; *Education Work Relationship; *Educational Environment; Educational Opportunities; Educational Quality; Field Studies; High Schools; *Magnet Schools; Program Effectiveness; Vocational Education; *Work Experience Programs
IDENTIFIERS	*Los Angeles City Schools CA; *School Based Enterprises

ABSTRACT

The effectiveness of work-based learning (WBL) was examined in an exploratory study of WBL in three different programs in Los Angeles: a transportation career academy (TCAP), medical magnet high school (MMHS), and school-based enterprise (SBE). Data were collected from the following sources: surveys examining students' WBL experience; interviews with teachers, mentors, employers, and others associated with the programs; observations of the students at work; and in-depth student interviews. The SBE gave the most latitude to students with respect to choosing work tasks and even work times, whereas work at the other two sites was more closely monitored and scheduled. The MMHS and TCAP incorporated formal evaluation procedures between the worksite and the school. Training for the TCAP students followed a "show and tell" model, whereas the MMHS students were apprentices in a university science laboratory where teaching was embedded in nearly every activity. The SBE used a talented mentor pool, outside conferences, free advice from experts, and opportunities to practice in a fail-safe environment. No site developed students' problem-solving skills around substantive, technical matters. The TCAP and MMHS programs had explicit career awareness or exploration goals. All three sites incorporated structural features for connecting school and work. (Contains 58 references.) (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 414 472

NCRVE

National Center for Research in Vocational Education

University of California, Berkeley

LEARNING HOW TO LEARN AT WORK: LESSONS FROM THREE HIGH SCHOOL PROGRAMS

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

● Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

CE 075 403

Supported by
the Office of Vocational and Adult Education,
U.S. Department of Education

BEST COPY AVAILABLE

This publication is available from the:

National Center for Research in Vocational Education
Materials Distribution Service
Western Illinois University
46 Horrabin Hall
Macomb, IL 61455

800-637-7652 (Toll Free)

LEARNING HOW TO LEARN AT WORK: LESSONS FROM THREE HIGH SCHOOL PROGRAMS

Cathleen Stasz
Tessa Kaganoff

RAND

National Center for Research in Vocational Education
University of California at Berkeley
2030 Addison Street, Suite 500
Berkeley, CA 94720-1674

Supported by
The Office of Vocational and Adult Education
U.S. Department of Education

December 1997

MDS-916

FUNDING INFORMATION

Project Title:	National Center for Research in Vocational Education
Grant Number:	V051A30003-97A/V051A30004-97A
Act under which Funds Administered:	Carl D. Perkins Vocational Education Act P.L. 98-524
Source of Grant:	Office of Vocational and Adult Education U.S. Department of Education Washington, DC 20202
Grantee:	The Regents of the University of California c/o National Center for Research in Vocational Education 2030 Addison Street, Suite 500 Berkeley, CA 94720-1674
Director:	David Stern
Percent of Total Grant Financed by Federal Money:	100%
Dollar Amount of Federal Funds for Grant:	$4,500,000
Disclaimer:	This publication was prepared pursuant to a grant with the Office of Vocational and Adult Education, U.S. Department of Education. Grantees undertaking such projects under government sponsorship are encouraged to express freely their judgement in professional and technical matters. Points of view or opinions do not, therefore, necessarily represent official U.S. Department of Education position or policy.
Discrimination:	Title VI of the Civil Rights Act of 1964 states: "No person in the United States shall, on the ground of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance." Title IX of the Education Amendments of 1972 states: "No person in the United States shall, on the basis of sex, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any education program or activity receiving federal financial assistance." Therefore, the National Center for Research in Vocational Education project, like every program or activity receiving financial assistance from the U.S. Department of Education, must be operated in compliance with these laws.

Related Readings from NCRVE

for Learning How To Learn at Work: Lessons from Three High School Programs (MDS-916)

by Cathleen Stasz and Tessa Kaganoff

How Health Career Academies Provide Work-Based Learning

Properly structured jobs, whether paid or unpaid, can provide high school students with the opportunity to apply and extend what they have learned. Health-related occupations lend themselves readily to this career-related model of education. However, work-based learning is most beneficial if connected to an interdisciplinary curriculum in which occupational and academic content are combined and where students are prepared for postsecondary education as well as work. This is a tall order. A few recommendations designed to facilitate such efforts are described in this article. By D. Stern, M. L. Rahn.
MDS-1026/July 1995/$2.00

Linking School-Based and Work-Based Learning: The Implications of La Guardia's Co-op Seminars for School-to-Work Programs

Few models exist for fledgling school-to-work programs, especially for activities connecting school-based and work-based learning. This profile of New York City's La Guardia Community College's co-op seminars offers real-life lessons about successful strategies and potential challenges for these connecting activities. The authors—Norton Grubb, NCRVE's Berkeley site director, and Norena Badway—highlight the implications for school-to-work programs, including the importance of a supportive culture around co-op; the need to carefully consider pedagogy as well as selection and training of faculty; and the need for funding for coordination tasks. They warn that the separation of co-op, work-based learning, and school-to-work from the "regular" or academic classes may mean that co-op suffers budget cuts first. The only way for school-to-work programs to find a permanent place, the authors conclude, is for the work-based learning component to become as central to the educational purposes of the institution as math, English, or science. This detailed description of a program with many exemplary aspects offers an excellent model for individuals developing new connecting activities for school-to-work programs. By W. N. Grubb, N. Badway.
MDS-1046/December 1995/$3.25

Work-Based Learning in Two-Year Colleges in the United States

This report documents the first of two studies on the status of work-based learning in America's community, junior, and technical colleges. The intent of this first study was to determine the aggregate depth, scope, and quality of work-based learning in the nation's two-year colleges. The timing of this research just prior to passage of the federal School-to-Work Opportunities (STWO) legislation provides a baseline from which progress on implementation of new work-based learning programs involving two-year postsecondary education can be assessed. The overarching goal, as STWO legislation overlays the nation's educational system, is to learn if America has or may soon have in place the structures to meet new federal STWO directives. By D. D. Bragg, R. E. Hamm, K. A. Trinkle.
MDS-721/March 1995/$9.00

☞ Call **800/637-7652** to order.
Check out NCRVE's complete Products Catalog at http://ncrve.berkeley.edu

ACKNOWLEDGMENTS

Many individuals contributed to this research project. First and foremost are the students and staff associated with the programs we studied. Because they participated under conditions of confidentiality, we cannot thank them by name. In every program, staff gave their valuable time to answer our numerous questions and many helped us make sure we were asking the right ones. The students took us into their confidence and provided a unique perspective of program participation. We thank them all for their interest in the study and hope that we have faithfully reported their views and insights.

Sally Ann Law assisted in the design of student surveys and interview protocols. Kim Ramsey developed the fieldwork procedures and participated in fieldwork. Conversations with Allan Collins at an early stage of the study were most helpful for developing the conceptual framework. Beth Giddens, RAND communications analyst, improved the report's organization and exposition. Donna White prepared the manuscript. David Stern and Mike Timpane provided useful feedback on an earlier draft. The reviewers of this report, Stephen Billett of Griffith University, Australia, and Carolyn Dornsife of NCRVE, greatly improved it.

This project is dedicated to the late Charles S. Benson, director of National Center for Research in Vocational Education from 1988-1992. His vision for education continues to inspire us.

PREFACE

During the 1990s, work-based learning (WBL) has gained increasing popularity. In their efforts to redefine the relationship between school and work and to improve youth transition from school to employment, many educators, employers, and policymakers, have promoted WBL as one element of a school reform strategy. The School-to-Work Opportunities Act of 1994 provided federal funds to expand and develop school programs that incorporate educationally valuable work-based learning experiences. Presently, relatively little is known about the quality of these programs in terms of the characteristics of worksites that provide WBL or the kinds of skills and knowledge that students acquire.

In 1996, RAND began an exploratory study to examine WBL, with particular attention paid to the students' experiences and the social context of learning at work. This report draws on case study and survey data to describe the characteristics of teaching and learning in WBL and to identify how the work context supports (or hinders) both. It should be of interest to teachers, employers, or others involved in developing and implementing WBL programs.

The research reported here was conducted for the National Center for Research in Vocational Education, University of California at Berkeley, supported by a grant from the U.S. Department of Education, Office of Vocational and Adult Education.

EXECUTIVE SUMMARY

During the 1990s, work-based learning has gained prominence as one element of local, state, and federal school reform strategies. Federal legislation passed as the School to Work Opportunities Act (STWOA) of 1994, for example, calls for redesigning educational programs to include both school-based and work-based learning (WBL). STWOA defines work-based learning as a planned program of work experience linked to school. It further specifies that WBL include training on the job, supervision by workplace mentors, and instruction in general workplace competencies and "all aspects of the industry." Successful completion of paid or unpaid work experiences (paid experiences are preferable under STWOA) should lead to a portable certificate. A recent evaluation of states receiving funds under STWOA indicates that developing work-based activities are the top priority.

Not surprisingly, the renewed interest in WBL raises questions about its effectiveness. Previous research provides some information about student outcomes associated with cooperative education, school-based enterprises, and other types of programs that incorporate WBL, but our understanding is sketchy at best, particularly for newer programs promoting broader purposes. While research suggests that the quality of work experience matters, there is little systematic information about quality across programs or even consensus on how to define it. Hardly any attention at all has been given to the actual experiences of students during WBL or the ways those experiences contribute to, or hinder, their intellectual and occupational development.

Research Approach and Questions

This exploratory study adopts a different approach than previous research by focusing explicitly on the workplace as a learning environment for students. It draws on research on learning at work from a sociocultural perspective to characterize the sorts of instructional activities and learning tasks that students encounter. The advantage of this approach is to draw attention to the teaching and learning process itself—the process that teachers in school or at work have the most ability to shape.

This study aims, first, to understand these workplaces as learning environments for young people. Specifically, it examines the social means by which work tasks are established and accomplished by students. It characterizes teaching at work—Who does it? and How does the community of practice support teaching and learning?

Our second main objective is to understand what students learn from WBL, including technical, generic, social skills, and work-related attitudes. The study does not measure learning formally, but, rather, asks what opportunities are presented for learning different skills or attitudes and what students appear to learn from these opportunities, based on our observations and their own reports. We also explore the relationship between school-based and WBL in these programs, since this link is crucial to ensuring WBL quality.

The study examined WBL in three different types of programs in Los Angeles, with an emphasis on the students' perspective and experience. The three programs operate in the same large, metropolitan school district and serve similar populations of mostly minority students. About 170 students participate in the Transportation Career Academy Program (TCAP), which emphasizes preparation for both entry-level jobs and careers in transportation-related occupations. During their junior and senior years, students can participate in an eight-week, paid internship in a transportation-related field. We observed two students performing internships at engineering construction firms. Students' work was primarily clerical, but in some cases it was related to technical areas.

The Medical Magnet High School (MMHS) provides unpaid internships in a variety of medical settings. The school emphasizes a college-preparatory curriculum for grade 10-12 students, with internships primarily provided for the purpose of career exploration. Students rotate in several placements for one morning a week throughout the school year. Students receive elective course credit for their internship work. We observed two students who were hired to work over the summer as laboratory assistants in the science department at a local university. These students assisted in conducting neuromuscular research projects.

At the School-Based Enterprise (SBE), forty student-owners sell their own salad dressing and produce from their garden. The SBE is housed on a high school campus, and students work after school for a few hours, odd hours over weekends, and over the summer. Students learn all aspects of running a business, with an emphasis on entrepreneurial skills. Students receive points for their work, which are exchanged for the dollar value of company shares upon high school graduation.

At each site, students completed a survey about their WBL experience. The study team interviewed teachers, mentors, employers, and other adults associated with the programs. We also observed students at work and interviewed them to gather in-depth information on WBL.

Characteristics of Work-Based Learning

Following work by Moore (1981) and others, the study attends to the social context for learning and working and examines certain characteristics of WBL. Our analysis first focused on the social means by which tasks are initiated, accomplished, and processed, as this is when the process of education is set in motion. Then we examined the pedagogy of worksites and the community of practice that students encounter.

Social Means To Support Tasks

Our analysis of workplaces as learning environments shows, first, that the types of tasks students engage in and the means by which they are established, accomplished, and processed, varies markedly across the three programs. The SBE gives the most latitude to students with respect to choosing work tasks and even work times, while work at the other two sites was more closely monitored and scheduled.

By and large, the tasks students had to accomplish required little creativity, although a few SBE students had opportunities to be creative. Most of the time, students simply followed directions to complete a variety of tasks. Their coworkers, supervisors, or mentors provided the social supports students needed to learn and do their jobs.

Although students received ample feedback on task performance, they were not always sure what was expected of them. Two programs, MMHS and TCAP, incorporated formal evaluation procedures between the worksite and the school and students were conversant with the frequency and nature of the assessment process.

Pedagogy of Worksites

A second characteristic of the learning environment concerns the pedagogy of worksites. Not surprisingly, training for the TCAP students, who worked in private, for-profit companies, followed a "show and tell" model. This approach seemed suited to the level of student work—primarily clerical. One firm was also dedicated to training and staff development, and their intern had more learning opportunities unconnected to productive work. In contrast, the MMHS students were apprentices in a university science laboratory where teaching is embedded in nearly every activity. The mentor had extensive teaching experience, and she created a curriculum tailored to the students' needs. Likewise, the SBE advisors had a strategy for teaching students the skills they needed to make a positive contribution to the business and, more generally, to be successful in academic pursuits and in life. To accomplish a variety of learning goals, the SBE utilized a talented mentor pool, outside conferences or workshops, free advice from experts, and opportunities to practice in a fail-safe environment. The two sites located at educational settings incorporated educative purposes for WBL, in addition to having students engage in productive work.

Student Participation in Communities of Practice

The communities of practice that students entered were also strikingly dissimilar. The TCAP students were "junior" employees and, for all practical purposes, treated as such. They were there to make a productive contribution to the work and were included in all business activities appropriate to their position. MMHS students had a more difficult time, as they lacked status in the research laboratory and had no real means to acquire it. To be successful, they had to interact in a complex, sometimes unfriendly social environment. They were included in social activities, like basketball games, but not in the weekly meetings that dealt with the lab's program of research. They were peripheral participants in this community. The SBE students created and fully participated in their community of practice, with guidance from their advisors. These students worked in a nurturing environment, where their biggest social challenge was to learn to work with one another.

Opportunities for Learning

The study also determined the opportunities that WBL presented for learning technical and social skills, work-related attitudes, generic skills (e.g., problem-solving, teamwork, communications), and broader knowledge of industries or careers. Since school-based learning and WBL are meant to complement one another, the study also addressed the extent and depth of that connection.

Technical, Personal, and Social Skills and Work Dispositions

Of the three sites, the MMHS students were most challenged—they had to learn highly technical knowledge and skill and identify their place in a complex social milieu. Students in the other programs were less challenged socially, and their work was not always demanding. SBE students could develop fairly sophisticated technical skills, if they so chose. All students learned valuable personal lessons about their current career interests and their capabilities.

Students also learned a lot about what it means to work. They learned to take responsibility, to work hard, to meet deadlines, and to be persistent. They learned how to dress and act appropriately to their work situation. The more relaxed SBE environment did not provide as many opportunities as other worksites to develop some valuable work habits, such as being on time or knowing when to dress more formally.

Problem-Solving Skills

By and large, these worksites did not develop students' problem-solving skills around substantive, technical matters. Most of the problems students encountered had to do with the procedural aspects of their work and were easily solved by themselves or with assistance from others. Although the MMHS program's science fair project might have been an opportunity for students to engage in more substantive problem solving, it was unfortunately structured in such a way that students did little of the work on their own. SBE provided some interesting problem-solving events, but these were not available to all students. Since SBE students decide which activities to volunteer for, and since it is hard to tell in advance where complex problems might emerge, the opportunities to develop some skills are left to chance.

SBE students developed some teamwork skills, although teams were loosely organized and their makeup varied across activities. TCAP and MMHS students worked independently, for the most part, but learned about job and task interdependencies. SBE students utilized a broader array of communication skills because they had more interactions with external audiences and had to communicate for more varied purposes than students at other worksites.

Opportunities To Learn about an Industry

TCAP and the MMHS program had explicit career awareness or exploration goals, and these students enhanced their understanding of the transportation and science fields. Individuals at the university lab displayed a strong interest in motivating minority students to pursue science careers and in some ways went beyond the program's expectations. While the MMHS program views student as volunteer interns, the lab hoped to turn them into productive assistants and to make efficient use of their time during the school year. At the SBE, students had opportunities to learn all aspects of running a business, but we were not able to determine how many students took advantage of these opportunities.

Connections to School Learning

Since school-based learning and WBL are meant to complement one another, we hoped to see strong links between school and work. TCAP seemed to do a good job of preparing students to enter the workplace. They conducted workshops for students to help them adjust to an adult working environment and the school program gave them solid skills that employers could use. But since the work experience is not concurrent with school, the students are left to make these connections on their own. In this case, then, school learning appeared to enhance learning at work.

The MMHS program incorporated several structural features for connecting school and work, such as agreements with resource sites that listed learning objectives for students, and requirements for students to write journals about their work experiences. The students working at the lab, however, were paid employees, not volunteers. The lab work was so advanced that students had little prior knowledge from their school science classes, but found some opportunities to apply math or chemistry knowledge. Somewhat ironically, the science fair project requirements took precedence over real experience. In this case, work appeared to enhance school learning, but was otherwise unconnected to it.

The SBE was perhaps the best kept secret at the high school. The only teacher connected to the program was one of the SBE's original founders. It does not receive school or district funds. Indeed, the enterprise's primary connection to the school is its location on school property. Although the students' school classes were not connected in any way to the SBE, the SBE strongly supported academics. Student-owners could be tutored in any subject, receive preparation for SAT and ACT testing, and get personal assistance to apply to college. Doing well in school and raising academic aspirations were as important as running the business. The SBE clearly enhanced school learning and overall academic achievement: nearly all the student-owners go on to college, compared to fewer than half of the graduating seniors in the same high school.

Implications and Further Questions

Overall, we conclude that most of what we learned in examining teaching and learning opportunities in these programs was quite positive. The longer-term, fairly intensive WBL experiences studied here provided opportunities for students to learn many work-related skills and attitudes. Students were generally satisfied with their work experience, although, on average, felt work was not very challenging. Although the programs varied with respect to opportunities for learning specific skills, the WBL experiences generally met each program's goals. However, the study does raise some questions and implications that we offer not as criticisms of the programs, but as general lessons to consider when developing educationally valuable WBL opportunities for young people.

The report discusses several implications for the design and delivery of WBL programs. First, to adequately prepare students for their work experience, it is important for program staff to understand the social context of the WBL setting. The implicit or explicit model of pedagogy and the firm's views of training can affect the kind of student who can succeed, as can the expectations that employers have for students capabilities. Training opportunities and expectations can vary considerably with work settings.

In addition to preparing students for work, program coordinators need to carefully match students and worksites. Although this suggestion may be self-evident, even those coordinators who worked closely with employers did not always make a good match. In addition, programs use irrelevant criteria, such as grades, to determine where to place students. Program coordinators might make better matches by considering whether a student is suited to a particular social context—and vice versa—in addition to making placements on the basis of knowledge or interest.

Third, students need skills to learn how to learn at work. Students must know when to ask questions, take initiative, have the confidence to solve problems, and know how to work together. Students must take responsibility for their own learning. Unfortunately, we heard numerous stories that schooling does quite the opposite. Students told us that learning at school means listening, not asking questions. It means working alone, not with other students. It means asking the teacher what to do, not figuring it out for oneself. In school, a good excuse is all you need to get out of doing something. This situation leads to very different implications: (1) provide WBL experiences for more students because that experience will likely provide the best opportunities for students to learn how to learn at work; and (2) improve school-based teaching to produce active, engaged learners who can work alone and with others, and who will be better prepared to learn how to learn at work. Either remedy entails a serious, and costly, school reform strategy.

The study also raises some important questions for further research and consideration. First, who teaches at work? The work-based learning sites in this study were very different with respect to teaching strategies and expertise. This study suggests that much more serious attention be paid to providing appropriate training to worksite mentors and to monitoring their performance as teachers.

This study corroborates other research on school-to-work programs in finding that school and work are often only loosely connected and that any connection is difficult to establish. But the study also shows that students learn many valuable lessons and develop many skills where connections between school and work are weak. This raises questions about the nature of connections between school and work. What types of connections are possible, and which are most necessary for achieving high-quality outcomes?

TABLE OF CONTENTS

Acknowledgments i
Preface iii
Executive Summary v
Introduction 1
  Definitions and Purposes of Work-Based Learning 2
  Quality of Work-Based Learning 4
  Research Approach and Questions 6
  Limitations of the Study 7
  Organization of this Report 8
Conceptual Approach and Methods 8
  Learning at Work 8
  The Field Study 17
Overview of Programs and Work Experiences 22
  Program Overview 22
  Work Experiences 30
Learning at Work 38
  Workplaces as Learning Environments 38
  What Do Students Learn? 54
Conclusions and Implications 69
  Conclusions 70
  Implications and Further Questions 74
References 81

INTRODUCTION

During the 1990s, work-based learning has gained prominence as one element of local, state, and federal school reform strategies. The School to Work Opportunities Act of 1994 (STWOA), for example, calls for redesigning educational programs to include both school-based and work-based learning (WBL). The act defines WBL as a planned program of work experience linked to school. It further specifies that WBL include training on the job, supervision by workplace mentors, and instruction in general workplace competencies and "all aspects of the industry." Successful completion of paid or unpaid work experiences (paid experiences are preferable under STWOA) should lead to a portable certificate. By late 1996, federal funding totaling $695 million had been provided to 37 local and state partnerships. A recent evaluation of states receiving funds under STWOA indicates that developing work-based activities are the top priority (Hershey, Hudis, Silverberg, & Haimson, 1997).

While WBL is not new—cooperative education has been recognized by federal authority since the 1917 Smith-Hughes Act—it has primarily been associated with vocational education programs. Co-op in high schools and community colleges is typically designed as an adjunct to vocational training leading to specific occupations. The renewed interest in WBL incorporates much broader purposes that, for example, tie WBL to the academic curriculum and to preparing students for a four-year college or university. Thus, WBL is now intended for all students, whether they intend to work after high school or pursue higher education (Urquiola et al., 1997).

Not surprisingly, the renewed interest in WBL raises questions about its effectiveness. Previous research provides some information about student outcomes associated with cooperative education, school-based enterprises, and other types of programs that incorporate WBL, but our understanding is sketchy at best, particularly for newer programs promoting broader purposes. Some evidence suggests that the quality of work experience matters (Greenberger & Steinberg, 1986; Stern & Nakata, 1990; Stern, Hopkins, Stone, & McMillion, 1990), but there is little systematic information about quality across programs or even consensus on how to define it. Several studies document structural features of WBL programs, such as the nature of school-employer partnerships, curriculum changes, or connecting activities (e.g., Hershey et al., 1997), and others describe what students do at work (e.g., Hamilton & Hamilton, 1997). However, hardly any attention at all has been given to the actual experiences of students during WBL or the ways those experiences contribute to, or hinder, their intellectual and occupational development (OTA, 1995).

This exploratory study takes a different approach from previous research by examining the characteristics of WBL sites as learning environments for participating students. The study examined WBL in three different types of programs in Los Angeles, with an emphasis on the students' perspective and experience. At each site, students completed a survey about their WBL experience. The study team interviewed teachers, mentors, employers, and other adults associated with the programs. We also observed students at work and interviewed them to gather in-depth information on WBL. This report focuses on two issues. First, it characterizes the learning environments that students are exposed to when engaged in school-supervised WBL activities. Second, it discusses opportunities WBL presents for learning, including technical and academic knowledge and skills and work-related attitudes.

Definitions and Purposes of Work-Based Learning

Before delving into the particulars of this study, it is useful to place the research in a broader context. Programs funded under STWOA are intended to build on previous federal initiatives and existing programs, including Tech Prep, career academies, school-based enterprises, and cooperative education. Each of these program types or models has specific characteristics which support different purposes for WBL. In practice, each type has many variants to accommodate local conditions and needs. Consequently, WBL implementation is not uniform, even for those programs supported by STWOA, which defines WBL in a particular way.

Since STWOA expands on previous initiatives, it is difficult to precisely gauge the number of participating students engaged in WBL. A recent review estimated that 49% of secondary schools offered cooperative education programs, 34% offered other work experience, 19% had school-based enterprises, and about 7% offered Tech Prep or school-to-apprenticeship (Stern, 1992). A U.S. Department of Education report to Congress in September 1996 reported that about half a million students, representing

1,800 schools, are engaged in school-to-work systems, with 53,000 WBL sites available for students.[1]

A recent review by Urquiola and his colleagues (1997) identifies at least five purposes for WBL: (1) acquiring knowledge or skill related to employment in particular occupations or industries; (2) providing career exploration and planning; (3) learning all aspects of an industry; (4) increasing personal and social competence related to work in general; and (5) enhancing students' motivation and academic achievement. These purposes are not mutually exclusive. In practice, different programs emphasize different purposes, but given limited student time, it is probably not possible to address all purposes simultaneously.

Job shadowing experiences, for example, primarily serve career awareness and motivational purposes—they enable students to get a general sense of a career area and perhaps to see firsthand how learning in school is related to the world of work. Longer-term paid or unpaid internships provide opportunities for learning general or specific knowledge and skills related to employment.

A crucial element of WBL activities, whether long or short, paid or unpaid, is the link to the school curriculum, so that students can see how the skills they learn in class are needed in the workplace and have a chance to apply them (Hershey et al., 1997; Stern, Finkelstein, Stone, Latting, & Dornsife, 1995). School activities can help students understand what they have learned at work (Goldberger, Kazis, & O'Flanagan, 1994), and can integrate academic and employment-related instruction (Council of Chief State School Officers [CCSSO], 1994).

Forging this connection between school and work is difficult and typically requires some structural feature to be built into the program. Studies of programs that incorporate WBL describe several ways to support the school-to-work link, such as written training agreements that incorporate student learning objectives (Stern, 1991), seminars to explicitly discuss school and work connections (Grubb & Badway, 1995; Wieler & Bailey, 1997), and workforce performance assessments linked to grades.

---

[1] These figures represent eleven states (210 partnerships) with complete data on schools, about one-fourth of the 818 partnerships receiving funds through October 1996.

However, the research also shows that links between school and work experience were infrequent and often tenuous (Hershey et al., 1997; Wieler & Bailey, 1997).

The establishment of a linking component is crucial to WBL because without it, it is unclear why school-supervised WBL has any advantages over regular work experience. Since youth jobs are plentiful, on average—in 1992, 80% of high school seniors worked for pay outside of school—students can presumably gain valuable work-related skills and attitudes in those jobs (U.S. Department of Education, 1992).[2] If so, then there would be little need to develop school-supervised WBL programs unless they add value to schooling. Given the high transaction costs associated with developing and implementing WBL programs in schools, it is important to document the benefits of school-supervised WBL.

Quality of Work-Based Learning

Regardless of the definition or purposes adopted for WBL, proponents believe that giving young people responsibilities outside of school will help them make the transition to adulthood. Since research and experience tell us that not all work experience is beneficial (Greenberger & Steinberg, 1986), it is important to address the quality of WBL experiences. Defining program quality would also help determine what school-supervised WBL provides over and above school-based instruction alone or regular work experience.

At present, there is no consensus on how to define program quality. Rather, researchers and program developers look for evidence that programs achieve their intended purpose. Indeed, case studies provide many examples of WBL's effectiveness in promoting the purposes discussed above. Several studies show that WBL can help students acquire specific job-related knowledge or skill (Bragg, Hamm, & Trinkle, 1995; Pauley, Kopp, & Haimson, 1996; Urquiola et al., 1997), as well as knowledge of all aspects of an industry (Goldberger et al., 1994; Hamilton & Hamilton, 1997; Nielsen Andrew, 1996; Stern et al., 1995). WBL offers important information about jobs and careers that students cannot otherwise obtain, which can in turn affect their course of study and decision to pursue higher education (Grubb & Badway, 1995; Pauley et al., 1994; Pedraza, Pauley, & Kopp, 1997). In addition to learning technical job skills, students can enhance personal and social competencies related to work in general (Hamilton & Hamilton, 1997; Stasz & Brewer, in press). WBL offers students a context for understanding how skills learned in school are useful and important in work, thus enhancing their school learning (Hamilton & Hamilton, 1997; Stone, Stern, Hopkins, & McMillion, 1990). Finally, some studies find that WBL engages students who are otherwise uninterested in school and motivates them to stay in school (Phelps, Scribner, Wakelyn, & Weis, 1996; Urquiola et al., 1997).[3]

---

[2] Although, on average, the majority of high school youth find jobs, employment rates differ for different groups. In 1992, for example, 24% of high school students aged 15-24 were working, but white students were twice as likely to be working as minority students (U.S. Department of Commerce, 1992). Some programs, including one in our study, are specifically designed to provide work experience for minority youth because real opportunities in the community are scarce. In this context, WBL may have value in providing work for experience alone, irrespective of its relationship to school. In addition, conventional wisdom characterizes youth jobs as low-level "McJobs" which do not afford students the opportunity to gain higher-level skills that might enhance their overall employability. Studies that closely examine the quality of youth jobs in comparison to school-supervised work experiences, however, have not been conducted.

While case studies of WBL programs show many effects from program participation, not all are positive. Since WBL can be a time-intensive activity, it is possible that students' academic performance might suffer. They might have less time to do homework, may be tired or late for class, may take fewer courses, or may have lower grades. Several studies show such negative affects associated with WBL (e.g., Stasz & Brewer, in press; Stone et al., 1990). The research indicates that once students work 10-20 hours per week, their school performance begins to deteriorate (Urquiola et al., 1997).

In addition, academic benefits of WBL may not be realized without explicitly focusing on academics or creating the connection between academic concepts and their practical application (Hamilton & Hamilton, 1997). Presently, the notion that "situated" or "authentic" learning, such as the opportunities that may be provided in WBL, can advance learning in academic subjects is more theoretical than empirically based (Raizen, 1989; Resnick, 1991). Although a recent study by Newmann and Wehlage (1995) shows gains in academic achievement as a result of "authentic" instruction in classrooms, the students were not participating in WBL.

---

[3] See OTA (1995) and Urquiola et al. (1997) for further discussion on the various rationale in support of WBL.

A final drawback to WBL is identified in studies of cooperative education, a form of WBL which is offered in 49% of secondary schools (Stern, 1992). Compared to nonworking students and students with jobs unrelated to school, co-op students perceive a stronger connection between school and work, have better attitudes toward both, and earn more after high school if they work for the same employers. On the other hand, they are also less likely to go to college than other high school graduates (Stern et al., 1995). Co-op students may gain in the short term—by improving their immediate transition to work and earnings—but at the same time they may forego longer-term benefits associated with college matriculation and completion.

Research Approach and Questions

Although school-supervised WBL opportunities are increasing for many high school youth, research on WBL effectiveness for helping students achieve a variety of learning goals is inconclusive. Our review of the purposes and quality of programs incorporating WBL suggests some positive benefits, but also raises some concerns. There appears to be little consensus on how to define program quality apart from the various purposes that WBL hopes to promote. Since programs have varied purposes and are structured in various ways, students' experiences in WBL can be vastly different. For WBL to add value to school learning, the two must be carefully coordinated. Yet links between students' work experience and the classroom are often tenuous.

An important gap in our knowledge concerns the actual experiences of students at worksites, especially how and what they learn. This exploratory study adopts a different approach than previous research by focusing explicitly on the workplace as a learning environment for students. It draws on research on learning at work from a sociocultural perspective to characterize the sorts of instructional activities and learning tasks that students encounter. The advantage of this approach is to draw attention to the teaching and learning process itself—the process that teachers in school or at work have the most ability to shape.

This study aims, first, to understand these workplaces as learning environments for young people. Specifically, it examines the social means by which work tasks are established and accomplished by students. It characterizes teaching at work—who does it and how does the community of practice support teaching and learning?

Our second main objective is to understand what students learn from WBL, including technical, generic, social skills, and work-related attitudes. The study does not measure learning formally, but, rather, asks what opportunities are presented for learning different skills or attitudes and what students appear to learn from these opportunities, based on our observations and their own opinions. We also explore the relationship between school-based learning and WBL in these programs.

Limitations of the Study

This study provides in-depth information about teaching and learning at selected WBL sites. Except for the school-based enterprise, selected study sites are not necessarily representative of the range of WBL experiences available to all students in a program. Rather, we asked program coordinators to nominate the worksites that provided, in their own opinion, high-quality, WBL experiences for our observation. These sites, then, represent "best practice" as defined by programs themselves. To the extent that they indeed provide valuable learning for students, then the sites may represent a standard that other programs could aim for.

Because the programs and WBL experiences have varied purposes and because of the situated nature of teaching and learning at work, this study does not aim for generalizability in the statistical sense. Rather, our study design is meant to reveal similar patterns across varied cases. These patterns describe important features of the social context of learning at work that are replicable in varied settings. In turn, they can provide insights to program developers about how to structure WBL experiences for students.

We did not attempt to formally assess student learning, but base our findings on observation and the students' own opinions. This limits our ability to determine what students actually learn. We also did not attempt to evaluate these programs to determine which one was "best." A comparative evaluation of student learning or other outcomes of interest would require a different design with complex controls. Two of the programs we studied systematically gather evaluation data of their own, and in this report we make use of relevant, available data gathered by the programs themselves (e.g., the college matriculation rates of program participants and nonparticipants at the same school).

Organization of this Report

Following the Introduction, this report is divided into four sections: "Conceptual Approach and Methods," "Overview of Programs and Work Experiences," "Learning at Work," and "Conclusions and Implications."

CONCEPTUAL APPROACH AND METHODS

Learning at Work

An important premise underlying WBL is that it can provide more "authentic" learning experiences for students than school learning.[4] Since work is an authentic activity by definition, WBL should give students the opportunity to engage in real work, to apply skills learned in school, or to learn new skills in an authentic setting. WBL differs from regular work experience because it links work to the school curriculum. Designing WBL to complement or build upon school learning is not an easy task. Work experiences, however authentic they may be, may or may not provide an effective means for students to learn or apply technical, social, or other skills or knowledge intended by program designers (Berryman, 1992). Authentic work is not necessarily meaningful, engaging, or challenging—it may be repetitious, boring, and require little skill. It may also be that tasks which appear peripheral to "purposeful" work may be deeply informing about the vocation or may be useful for other tasks.[5] Without some deeper understanding of work and learning at work, it seems difficult for program designers to determine

---

[4] Authenticity has been defined in various ways. Newmann, Secada, and Wehlage (1995) define authentic achievement as construction of knowledge through the use of disciplined inquiry that has some meaning or value beyond school. Similarly, Collins, Brown, and Newman (1989) define an authentic learning environment as one that enables students to apply knowledge in useful ways. Authenticity can also be thought about in terms of the target setting for the knowledge to be constructed—in this case, the workplace.

[5] For example, hairdressing apprentices can learn the importance of cleanliness and customer service through their "tea and tidy" activities. We thank Stephen Billett for this point and for this example.

BEST COPY AVAILABLE

whether a WBL site can provide relevant learning experiences or how such experiences are linked to schooling.

Since the outcomes of WBL rest on the quality of the learning experiences provided to students, it makes sense to develop a way to understand workplaces as learning environments. Toward that end, we view WBL from a sociocultural perspective. The sociocultural perspective argues that the social setting in which cognitive activity takes place is an integral part of that activity, not just the surrounding context for it (Lave, 1991; Resnick, 1991; Rogoff & Charajay, 1995; Vygotsky, 1978). The context of the social setting can include other actors, the task at hand, the organization of the work, the organization's training policies and practices, and so on. The knowledge, attitudes, or abilities needed for a particular job are shaped by the particular working context, and can only be understood from the perspective of individuals in the social setting (Hart-Landsberg, Braunger, Reder, & Cross, 1992; Martin & Beach, 1992; Scribner, 1984, 1988).

To understand the characteristics and outcomes of WBL, the sociocultural perspective suggests attention be paid to the tasks and activities students engage in as they are related to the social context. By examining tasks and context we can shed light on the two questions of interest in this study: What are the characteristics of WBL environments? What do students learn in them?

Defining the Learning Environment

What characteristics of work and working might be important for promoting teaching and learning at work? To characterize workplaces as learning environments, we draw on different, somewhat overlapping literatures that examine learning in non-school settings—experiential learning, workplace learning, and organizational learning.

Experiential Learning

Models of experiential learning view experience as the source of learning and development and pursue a way to examine and strengthen the critical linkages among education, work, and personal development. The workplace is seen as a learning environment that can enhance and supplement formal education and can foster personal development through meaningful work and career-development opportunities (Kolb, 1984).

Moore (1980, 1981) presents a useful framework for analyzing the social organization of education in non-classroom environments, based on a series of empirical studies of an experience-based high school program. In particular, his approach helps define the social means by which tasks are accomplished and the process by which participants in the social setting organize interactions to make learning possible. The process of education is set in motion when a student or worker is integrated into task activities.

Moore's analytic approach begins by defining phases of a task: (1) how the task is *established* for the student; (2) how the task is *accomplished* (or not) by the student; and (3) how the student's performance on the task is monitored or *processed*. He also defines two broad dimensions of tasks: (1) *logical-technical features* and (2) *pragmatic features*. Logical-technical features delineate the demands of the task in its more or less ideal form—for example, What skills, information, knowledge, procedures, and resources are needed to perform the task adequately? Pragmatic features refer to relations between tasks themselves and their specific social relations—for example, How central is the task to the effective operations of the organization? What social prestige or status is attached to the performance of the task? and What is presumed about the readiness of the person performing the task?

By looking at social means by which tasks are established, accomplished, and processed, the interactions that constitute education are revealed. That is, tasks and social means can also be considered in terms of pedagogical strategies—whether or not they are made explicitly for educational reasons. Moore (1981) discovered that the social means can vary considerably by situation. Settings differ, for example, in whether resources needed to accomplish a task are readily available to students or not. Moore also found that teaching at work "rests not so much on the rational assessment of the learner's needs by the supervisor as on a host of extrapedagogical factors embedded in the broader institutional context" (1981). This means that learning in a WBL environment can be highly variable.

27

Workplace Learning

Studies of work from the sociocultural perspective highlight the importance of the community of practice to learning (Stasz, Ramsey, Eden, Melamid, & Kaganoff, 1996). Lave and Wenger (1991) define community of practice as a set of relations among persons, activity, and world over time, and in relation with other communities of practice. Examples are the culture of a particular science research laboratory or a particular construction office. Through the process of "legitimate peripheral participation," learners participate in communities of practice—as newcomers master knowledge and skill requirements, they move toward full participation in the sociocultural practices of a community. This conception provides a way to think about WBL in two important respects: (1) the role of the students as learners and (2) the difference between the "teaching curriculum" and the "learning curriculum."[6]

Because of their special role as learners in the workplace, students may be viewed as peripheral members of a community of practice who will never reach full participation in the way that Lave and Wenger (1991) describe. The extent of a student's acceptance as a new community member or as an outsider may be important for understanding the learning opportunities open to him or her.

The teaching curriculum—defined by the organization or the community of practice—structures the learning environment by initiating specific learning opportunities or by defining what the newcomer is supposed to know. The teaching curriculum is often goal directed—it is organized to teach specific knowledge, skills, or practices. The learning curriculum, however, consists of "situated opportunities for the improvisational development of new practice" (Lave & Wenger, 1991, p. 97) or the learning resources available from the perspective of the learner. A student may be formally assigned to a mentor (teaching curriculum), for example, but may feel more comfortable asking questions of a coworker (learning curriculum).

---

[6] In education, similar distinctions are made between the "intended" curriculum (articulated by officials at the system or national level), the "implemented" curriculum (as interpreted by teachers in individual classrooms), and the "attained" curriculum (as evidenced by student achievement and attitudes) (Burstein et al., 1995).

Organizational Learning

The literature on learning and training in organizations also suggests several themes to examine. First, the organization's philosophy toward training and its existing training practices may affect the social context of work-based learning for students. If an organization views teaching or mentoring others, for example, as important and necessary, then adult workers may be more inclined to help student learners. If the organization views any time off-task as a threat to productivity, then employees may treat students as a nuisance.[7]

Organizations that place a high priority on training may define their teaching curriculum through specific strategies or practices to enhance learning at work. For example, "just-in-time" learning—acquiring skill or knowledge at the time and place where it is needed, instead of at a different time and in a different place—is one strategy for meeting high-performance goals (Stern, 1994). Organizations accomplish training goals in several ways, including quality meetings, job rotation, mentoring, cross-training, fostering groups or networks, classroom instruction, formal and informal on-the-job training (OJT), job aids, post-mortems, or problem-solving meetings. A firm's existing strategies and practices may also influence the nature of the learning environment and students' opportunities to learn.

In sum, this literature suggests, first, that learning environments should be conceptualized at different levels—as tasks that students engage in, as a role they play within a particular community of practice, and as a purpose they serve within larger work organization.

Second, the literature points to several aspects of the learning environment that the study needs to address; study design and data collection are presented later in the chapter:

1. The types of tasks students perform and the social means by which these tasks are established, accomplished, and processed

---

[7] Moore's (1981) discussion of an organization's structural features or its "ethos and ideology" is similar to the notions of community of practice and organizational learning discussed here.

2. The features of the tasks, in particular task demands and relations between tasks and the organization

3. The influence of the community of practice—how it goes about teaching students what they need to know and how it defines the student's role

4. The worksite "pedagogy"—the training philosophy and practices for promoting learning at work

Defining What Students Learn

What do students learn in work-based learning? WBL can accomplish different learning goals for students, depending on the program's philosophy and purpose and on the types of WBL experiences provided. Job shadowing or observation activities, for example, are sufficient if the learning goal is career exploration. However, if the learning goals include developing technical knowledge, social skills, or broader understanding of work, then more intensive worklike experiences, such as performing routine or complex tasks, are required. The literature identifies several kinds of skills and knowledge associated with more intensive WBL experiences that are of interest in this study, as follows[8]:

Technical Skills and Competencies

WBL should provide opportunities to learn high-level technical skills on the job. Beginning work tasks might begin with more basic skills that can be learned in a relatively short time and which serve as building blocks for acquiring high-level skills. Technical competence should include mastering procedures; understanding fundamental principles and concepts underlying procedures; building a capacity for analytical judgment; and, in many occupational areas, obtaining computer literacy. Technical competence also includes learning how to learn, in addition to performing work tasks. Ideally, students should come to understand that specific work skills comprise a foundation for continuous learning, not an end point (Hamilton & Hamilton, 1997).

---

[8] We discuss skills and attitudes in separate categories to understand how they vary among WBL experiences. In practice, of course, these components work in concert.

Generic Workplace Skills

WBL should also help students acquire "generic" workplace skills—skills and competencies that are required for most jobs, yet are distinct from technical knowledge (Secretary's Commission on Achieving Necessary Skills [SCANS], 1991). Three important types of generic skills include (1) problem solving, (2) communications, and (3) teamwork (Stasz, McArthur, Lewis, & Ramsey, 1990; Stasz, Ramsey, Eden, DaVanzo, Farris, & Lewis, 1993; Stasz et al., 1996). Each of these skills may have different characteristics, depending on the work context. Thus, it is important for students to be able to learn and use these skills as required in different work situations (Stasz et al., 1996). Generally, WBL provides an excellent opportunity to do so.

Discussions of skill needs in the changing workplace predict a shift in decisionmaking and problem solving from the supervisory level to the shop floor, where workers must cope on the spot with a growing number of unpredictable problems (Berryman & Bailey, 1992). Knowledge and skill are useful to the extent that workers can apply them to real problems and situations they face at work. While problem solving in school is typically well-defined—as in solving mathematics problems, for example—problems at work tend to be ill-defined, often unrecognized as problems, and have many possible solutions and solution methods (Lave, 1991). Students should be able to apply their technical knowledge to solving problems as they arise.

Many discussions of new skill requirements in the workforce mention teamwork as a necessary skill. Since teamwork is not a skill per se, but a description of how work is organized, whether a student has the opportunity to learn teamwork skills will depend on the organization of work. Work can be independent, requiring little teamwork, or interdependent. Teams can be organized in different ways—some are autonomous and work independently of supervision, while others require individual members to perform specific skills and not overstep their bounds (Stasz et al., 1996).

Communication skills are also widely cited as among the most important skills needed by today's workers (National Center on Educational Quality of the Workforce [NCEQW], 1995). Research suggests that the mode, style, audience, and purposes of communication differ significantly across jobs (Stasz et al., 1996). Students may find ample opportunity to develop some communication skills in their job, but not others. For example, the job might provide opportunities for students to deal with customers, but not make use of or improve their writing skills.

Personal and Social Skills

Many studies suggest that employers are relatively satisfied with technical skills of prospective employees, but see a need for improving their attitudes or dispositions toward work. However, it is not always clear what they mean. Some employers may seek workers who have initiative, whereas others might want workers who follow orders. Unfortunately, the theoretical and research literature does not provide a clear way to define these "non-cognitive" skills, which have been referred to as dispositions, attitudes, motivations, and volition, to name a few (see Stasz et al., 1996, for a review). However defined, the literature suggests that these non-cognitive factors can affect performance at work, and that social context plays a role in shaping them.

In our previous research, we referred to these non-cognitive factors as dispositions—"habits of mind" or individuals' tendencies to put their capabilities into action (Stasz et al., 1996). Dispositions are thought to influence how individuals deal with various situations, and are essential for performance. Ability is wasted unless a person has an inclination to use it (Perkins, Jay, & Tishman, 1993). In the workplace, the dispositions associated with success on the job are often defined by a community of practice or depend on the nature of the work such as tasks assigned and quality standards. Thus, the social context of WBL environments can determine the dispositions required and the kinds of lessons about work-related dispositions that students will learn.

Other researchers use different terminology to discuss similar non-cognitive factors that can be developed in WBL. For example, Hamilton and Hamilton (1997) define personal competence as self-confidence, initiative, motivation, commitment to continuous improvement, and career planing. They define social competence as acquiring a broader understanding of the organization such as its structure, relations between departments, roles and responsibilities of employees, and relations with customers. Their definition also includes teamwork and communications, discussed here as generic skills, and rules, norms, professional ethics, and other aspects of the social organization of the workplace.

Broad Understanding of an Occupation or Industry

While WBL has been traditionally associated with vocational education leading to a specific occupation, recent definitions incorporate broader purposes for WBL. One of these is to instill broad understanding of an occupation or industry in addition to learning specific skills. This approach is meant to reduce the chance that students' skills will become obsolete. Breadth is a quality of technical learning in a specific occupation, but also denotes introducing youth to the larger context in which they do their work.

Breadth can be accomplished in several ways. The school curriculum can teach "all aspects" of an industry, defined as including the following eight areas: planning; management; finance; technical and production skills; technology; labor issues; community issues; and health, safety, and environmental issues (Jacobs, 1995). In the workplace, students can learn about different aspects through work experiences. Breadth may be accomplished through job rotation, a practice often adopted by businesses for their own workforces. It can also be done by giving students special projects to accomplish at work or by including them in established firm-wide activities and events (e.g., company picnics, newsletters, and informational meetings) (Hamilton & Hamilton, 1997).

Enhanced Academic Achievement and Motivation

An important rationale for school-supervised work experiences like WBL, in addition to the opportunities available through regular youth jobs, is the need to link school and work. Creating an explicit link between the two is expected to enhance both learning and motivation. It can promote academic learning by providing opportunities to apply academic knowledge to real work problems. Research suggests that applied learning is more robust and promotes deeper understanding of academic concepts (Collins et al., 1989; Newmann & Wehlage, 1995). WBL may also help motivate students to apply themselves in school as they come to understand that school-based learning is useful or necessary to accomplish work tasks. Similarly, WBL can help inform students about the kinds of educational requirements needed to pursue a career in a particular field or industry, and thereby motivate them to choose a course of study that will help them along a particular career path.

Creating links between school and work requires coordination. The degree of coordination between school-based learning and WBL can be assessed by considering the presence or absence of several desirable features, including a written training agreement, a written training plan, supervision of students' work placement by teachers or program staff, release time for teachers to visit students on site, placement by teachers or program coordinators, and class grade depending on the achievement of work objectives (Stern, 1991).

In sum, the literature on WBL suggests that it can provide students an opportunity to learn a wide variety of skills and to develop important dispositions or attitudes toward work. In addition, by creating links between work and school, WBL can enhance skill development by providing opportunities to apply academic knowledge learned in school. In this study, we examined student opportunities to learn all the skill areas discussed above. We also examined links between school and work that could potentially promote learning in either setting.

The Field Study

To study WBL, we employed a multi-site, replicated case study design where similar sets of criteria were used to select participating programs and individuals within them, and in which common data gathering procedures were used across sites. This approach is suited to the present investigation because we are examining and interpreting ongoing processes in real-world contexts, where the processes to be studied (work, learning) are not sharply separable from the context and where the variables of interest are likely to outnumber the units of study (Yin, 1994).

The conceptual approach, derived from various research, suggests a multilevel analysis of work-based learning that takes at least three perspectives into account—(1) the individual student, (2) the communities of practice, and (3) the broader organizational setting. To gain different perspectives on the questions of interest, the research employed several data gathering procedures, including interviews with key actors, a student survey, observations of WBL, and document collection.

The analysis reported here draws primarily from interviews and observation and from selected survey data. Additional findings from the student survey are reported elsewhere (Stasz & Brewer, in press). Next, we provide a detailed description of our research and analysis methods. Table 2.1 illustrates the data sources related to variables of interest.

Table 2.1
Key Variables and Sources of Data

	Individual Interview	Student Survey	Task Interview	Observation	Documentation
Learning Environment					
• Task	x	x	x	x	x
• Community of Practice	x	x	x	x	
• Organization	x	x		x	x
Skills	x	x	x		x
Connections to School	x	x			x

Sample Selection

We sought programs that incorporated WBL and were willing to cooperate with the research demands of the study (interviewing students and adults associated with the program, including employers and worksite mentors; observing and interacting with students on the job). For the purposes of this study, we defined WBL to include any program for high school youth that incorporated structured work experience, paid or unpaid, in worksites outside of school or in school-based enterprises. Because WBL comes in many forms, we aimed to select a variety of programs that differ on key dimensions: the purpose of the program, the amount of WBL provided, and whether or not students were paid. Due to budgetary constraints associated with fieldwork, we looked for eligible programs in Los Angeles County.

We identified candidate programs through professional contacts with local school districts and education-employer partnerships and through previous research. The selection process involved several steps, including a telephone interview and meetings with program staff to negotiate study approval and to identify WBL sites that might cooperate with the research.

The final study sample for this report included three programs and four worksites, as shown in Table 2.2.[9] The section entitled, "Overview of Programs and Work Experiences," describes programs and WBL placements in more detail.

Table 2.2
Programs, Worksites, and Positions

Program	Worksite(s)	Position
Transportation Career Academy (TCAP)	Engineering firms	Assistant office engineer/ document control person (Student 1) No regular position (Student 2)
Medical Magnet High School (MMHS)	University research laboratory	Lab assistant/clerical assistant
School-Based Enterprise (SBE)	School-based enterprise	Student-owner

At programs where students completed WBL in a non-school setting, the project team consulted with staff to identify an appropriate worksite. We asked programs to identify their "best" examples of WBL—sites where students were exposed to "high-quality" learning opportunities, as defined by each program's own goals and expectations. We also sought both male and female students. The study team held additional meetings at nominated WBL sites to negotiate conduct of the observational portion of the study. We also met with students at the selected worksites to explain the nature of the study. Active parental consent was obtained for each student's participation.

---

[9] Since programs and individuals participated under conditions of anonymity, we use pseudonyms throughout this report.

Worksite Observations

Fieldworkers conducted each site observation over the course of about six days. The goal of the observation was to come to understand the students' WBL experience, with particular attention to the social and organizational context for the work itself (e.g., community of practice and the organizational context), the important and frequent tasks that students do (e.g., how tasks are established, how tasks are accomplished, what is accomplished, what skills are required, what is monitored, how monitoring takes place, what is processed, and a description of the range of tasks), and the connections between the school context and WBL (e.g., school policies and WBL placement policies).

Observations were scheduled to capture three aspects of work common to all jobs: (1) the start-up period, (2) everyday routines, and (3) everyday relations with others. We employed Spradley's (1980) framework for understanding social settings as a guide for questions, observations, and fieldnotes. The social setting framework includes the following dimensions: space, actors, acts, activities, events, objects, goals, time, and feelings.

Since jobs are socially organized and physically situated in different ways, we developed study plans that fit particular situations. Since Transportation Career Academy Program (TCAP) students worked in small offices, one researcher conducted all the necessary fieldwork for each in about six days. One fieldworker also completed both observations at the university research laboratory, but these took several weeks. The fieldwork for this program had to be spread out to accommodate the way student work was integrated into the lab's research schedule. Observation was also spread out for the School-Based Enterprise (SBE), in order to accommodate different kinds of scheduled activities at different locations such as grocery store demonstrations, weekly staff meetings, garden days, and off-campus meetings with business consultants. Two fieldworkers conducted observations at the SBE; one of them performed the interviews.

Formal Interviews

We conducted two types of semistructured, formal interviews. An interview with each program's coordinator covered general characteristics of the program (e.g., goals and objectives, students served, school program, connections between work and school) and features of the WBL portion of the program (e.g., employer recruitment, number and type of employers involved, types of jobs, characteristics of mentors, monitoring procedures). Mentor interviews included questions about the mentor's training and background, roles and responsibilities as a mentor, training and learning at the firm and for the WBL student, skills required for types of jobs the students held, and connections to the school. Students were asked questions similar to the mentor questions, plus questions about their background and school program. The number and type of interviews varied according to the structure of the program. Each interview lasted from one to two hours. In all, we conducted interviews as follows: TCAP—program coordinator, two students, and three mentors; Medical Magnet High School (MMHS)—two coordinators (at school and worksite), two students, and one mentor; SBE—two coordinators, one student, and one mentor. At all sites, additional informal discussions with students during the course of the observations supplemented the information sought through interview questions.

The second type of semistructured formal interview focused on a critical work task, which was chosen by the observer and worksite mentor. These interviews took about one hour and asked specific questions about the task, following Moore's (1981) framework. Interviews with mentors emphasized the main steps and details for accomplishing the task and its logical-technical and pragmatic features. Student interviews also focused on the main steps and details about how the task is established and accomplished as well as how feedback is given.

Document Collection

During the observations and interviews, the fieldworkers gathered various artifacts that offer additional evidence of teaching and learning at work. These included syllabi or learning objectives for WBL activities, job aids, reference materials, and procedures used by students to perform tasks, forms used for monitoring or documenting student performance, mentor training guidelines, and program policies.

Analytic Procedures

Following procedures developed in our earlier research (Stasz et al., 1990, 1993, 1996), the analytic phase of the field study involved an iterative process of indexing observational data, domain analysis, and the generation of themes. We developed an initial set of index categories that corresponded with our main variables of interest. We modified that initial list by adding categories that emerged at different sites.

Two fieldworkers coded interviews and observation notes. To achieve reliability in coding, fieldworkers indexed several sets of notes and interviews, then compared results, clarified definitions, and identified any missing categories.

The study team compiled separate case study reports for each site, then compared results and identified themes and issues across sites. Survey data and preliminary findings from each program were sent to program coordinators for their review and information.

OVERVIEW OF PROGRAMS AND WORK EXPERIENCES

Program Overview

This chapter provides an overview of the programs we studied and descriptions of students' work experiences in each. As indicated in the previous chapter, we completed work observations and interviews in three programs: a Transportation Career Academy Program (TCAP); a Medical Magnet High School (MMHS); and a School-Based Enterprise (SBE).

The three programs discussed in this report operate in the same large, metropolitan school district and serve similar populations of students.

The first program, TCAP, consists of three "schools within a school" at three different high school campuses. TCAP focuses on a transportation career theme, which is integrated throughout the curriculum. About 170 students participate across the three campuses. During the summer of their junior and senior years, students can participate in an eight-week, paid internship in a transportation-related field. The program emphasizes preparation for entry-level jobs in transportation-related occupations; for technical careers in related industries; and for professions in engineering, architecture, design, or urban planning, as related to transportation.

MMHS[10] provides unpaid internships in a variety of medical settings. The school emphasizes a college-preparatory curriculum for students in grades 10-12, with internships primarily provided for the purpose of career exploration. Tenth-grade students rotate through several placements for one morning a week throughout the school year. Juniors and seniors work one morning per week in one or two settings for the year; some students are hired to work in the summer as well. Students receive elective course credit for their internships.

The SBE, where students sell their own salad dressing and produce from their garden, is housed on a high school campus. The 35 to 40 student-owners work after school each day for a few hours, odd hours over weekends, and over the summer. Students learn all aspects of running a business, with a focus on entrepreneurial skills. While the program is not linked to a particular course of study in school, there is a strong emphasis on academics and college preparation.

Program Operation and Nature of Work Experiences

As mentioned earlier, the three programs show marked differences in some important dimensions—whether work is paid or unpaid; the relative emphasis of school versus work; and the length, number, and type of work experiences available. The programs are similar, however, in other important respects. Table 3.1 summarizes some important features of the programs.

Origin

The programs have very different origins, which partly explains the differences among them in the relative emphasis between school and work.

TCAP began in 1992 as an industry-education partnership, led by the local transportation agency. The transportation agency is in the midst of a 30-billion-dollar construction project which will require many skilled technical workers. The agency started the program as one way to promote workforce development in the region. The program's goals were to (1) create a prototype program for 9th- to 12th-graders geared to preparing them for careers in the transportation industry, (2) focus on the future education and training needs of those youth affected by the civil disturbances in Los Angeles, and (3) provide adequate linkages with business and employers to ensure that education and training match existing meaningful careers. Three high schools are participating, for a total of about 170 students (60 each at two schools and 50 at the third). About 65 11th- and 12th-grade students were paid interns in the summer of 1996.

---

[10] Individual study respondents and participating programs and firms were assured anonymity; all proper names appearing in this report are pseudonyms.

MMHS opened in 1982 through the efforts of a local medical university faculty who wanted to increase the number of minority youth pursuing health-related careers. They started the program at a local high school with a foundation grant, then lobbied the school district to support it as part of their magnet high school program. In the 1996 school year, MMHS enrolled 220 students in grades 10-12. MMHS was initially located at a local high school, but now occupies space next to the medical university. According to the principal, one reason for this move was to preserve the school's college-preparatory focus. The administrators at the original host high school wanted the program to provide work experiences that might help students prepare for entry-level work right after graduation.[11] MMHS administrators, however, did not want to run a "vocational" program—they felt that the students should, first and foremost, be preparing for college, whether they ended up pursuing a health-related career or not.[12] Over the years, MMHS established a reputation for excellence: state and district evaluations consistently rank it as one of the best schools in the state. In 1994, their graduation rate was 98.9%, with 90% of the students going on to college.

SBE began in 1992 following the Los Angeles riots. The students, who were already working a quarter-acre garden, decided they wanted to give something back to the community so they decided to create a product to sell. Building on their garden activities, they did some research and found that salad dressing is a top-selling product, and something that consumers are willing to experiment with. With some outside help from a local businessman in the salad dressing business, they developed a recipe for their first product. This year they introduced a second product. This program exposes students to all aspects of running a business, but also emphasizes college preparation. The student-owners receive points for hours worked and for participating in other activities (including academic activities like SAT preparation sessions). These points are converted into company shares. Upon graduation, students receive cash payments for shares, which they can use for college or other postsecondary education.

---

[11] In this school district, many of the magnet schools are housed at regular high school campuses.

[12] This emphasis on college preparation is reflected in several aspects of the program. They discuss the work experience portion as an internship, not work. The worksites are called resource sites, not employers. In fact, when we initially approached the school to participate in the study, the administrators declined because they said they were not a vocational program and were not providing WBL.

Selection

Each TCAP school recruits students by different methods. One school recruits students for the 9th-grade classes based primarily on student interest. Another started their program with 11th and 12th grades and used an application and interview process. The third school enrolled 9th-grade students through an application process. Since the school district and these schools have a large minority population, most students enrolled in these programs are Hispanic and African-American. The enrolled students appear to be fairly representative of the student body as a whole in their respective high schools.[13]

MMHS does not choose its students, but takes those assigned by the district through the magnet school lottery enrollment system. Students who apply for MMHS are supposed to come with some interest in pursuing a medical career. New SBE participants are recruited and selected by the current student-owners. New students go through an internship period, after which student-owners will vote on whether or not they can remain. Each year they elect enough new students to replace the number who have graduated. They must maintain a C average to remain in the program.

---

[13] As with any program, unknown selection effects may bias the sample. Students who seek out these programs may be more motivated, more interested in work, less interested in school, and so on. We did not attempt to account for selection or other mitigating factors that affect program participation.

Table 3.1

Selected Characteristics of Programs

	TCAP	MMHS	SBE
Primary Program Focus	Career preparation	College preparation	Career preparation
Purpose of Work Experience	Career exploration	Career exploration	Develop entrepreneurial skills
Wages	Paid employment	Unpaid internships; summer employment for a few students	Point equity system (college scholarship money)
Length of Work Experience	Full-time for eight weeks during the summer	One morning a week over several years	Weekly commitment varies, can participate for four years of high school
Type of Worksites	Firms in transportation field—engineering and/or construction	Medical focus; hospital department, clinics, university labs	School-based enterprise
Student Selection	Students at participating schools screened by counselor	Students assigned to magnet school by lottery	Current student owner-operators recruit and select future participants
Written Training Plan Agreements	Would like to develop a formal contract	Student learning objectives	NA; list of tasks all students must complete during the year
Mentor Training	Orientation	No	NA
Supervision at Worksite	Coordinator meets with sites work supervisors	Teachers check attendance	Two adult supervisors
Written Evaluation by Worksite	Yes	No	NA
Work Performance Linked to Grades	No	No—student journals graded	No
Program Identifies Placements	Yes	Yes	NA

Work Experience

TCAP students must be at least 16 years old to participate in WBL and must work full-time for eight weeks over the summer. As mentioned earlier, MMHS students spend one morning a week at their internship. Tenth- and 11th-graders rotate through four sites during the year, spending three to five hours per week at the internship site. Seniors typically spend five hours a week at one or two sites. Tenth-grade students also attend class two hours a week, which typically features guest speakers. SBE students work a varying number of hours, depending on their own level of interest. The office is open weekday afternoons from 3:30-6:00 p.m., weekends, and full-time during the summer.

As for type of work experience, the TCAP students intern in a transportation-related firm (such as engineering or construction). The MMHS students all intern in some health-related area (e.g., clinics, hospital departments, medical research laboratories, veterinarians' offices). SBE students have the opportunity to work on all aspects of the business, but in a single establishment—the business operates in a space provided by the high school.

Student survey data provides some information on the types of work experience provided in each program. We asked students to report the title of their job or position and their main duties (see Tables 3.2 and 3.3). More than three-quarters of TCAP students described themselves as clerk/secretaries, the MMHS students described themselves as volunteers[14] or as medical assistants, and the SBE students described themselves as student-owners.

TCAP students described their main duties as clerical (78%) or data entry (11%) (see Table 3.3). By contrast, only 4% of MMHS students and none of the SBE students described their work as clerical or computer-related. The MMHS students were engaged in laboratory work (23%), going on hospital rounds (13%), or working with patients (21%), while the SBE students were engaged in all aspects of the business.

---

[14] The school's view of WBL as a volunteer internship was well-ingrained in these students. Some had a difficult time with survey questions that referred to their WBL experience as their "job" because they associated jobs with work for pay.

Table 3.2
Students' Description of Jobs or Positions

	TCAP (N = 37)	MMHS (N = 53)	SBE (N = 22)
Volunteer	—	40	—
Student-Owner	—	—	100
Clerk/Secretary	78	4	—
Child Care Worker	—	2	—
Research/Lab/Pharmacy Assistant	—	28	—
Hospital Department Assistant	—	25	—
Nurse Assistant	—	2	—
Administrative Assistant	3	—	—
Customer Service Representative	3	—	—
Human Resources	5	—	—
Student Intern	5	—	—
Engineer's Assistant	3	—	—

Note: Percents do not sum to 100 due to rounding.

According to the survey, students in all programs seem equally satisfied with their work experiences as a whole (mean ratings 4.22 for TCAP, 4.18 for MMHS students, and 4.45 for SBE, on a five-point scale, 5 = extremely satisfied). Only three students, all enrolled in TCAP, said they were "extremely dissatisfied" with the experience.

Coordination

Two of the programs have a written agreement between the school and worksite. TCAP does not have a formal contract with the employers at this point, but would like to develop one in the future. TCAP does run an orientation session, however, in which the supervisors and interns have an opportunity to meet each other before the internship begins. In addition, students have training sessions to prepare for the internship. They cover topics such as how to dress and how to behave at work.

At MMHS, each resource site provides a statement of learning objectives that all students are expected to achieve during the rotation. In addition to keeping their daily journals, at the end of each rotation students must answer questions corresponding to the learning objectives, interview two people at the site, and learn about the college path to their job. Supervising teachers collect journals and monitor student attendance at the internship site.

Table 3.3

Students' Descriptions of Main Duties at Worksite

	TCAP (N = 36)	MMHS (N = 52)	SBE (N = 22)
General Clerical/Office Work	78	2	—
All Activities in Business (gardening, marketing, office activities)	—	—	100
Computers/Data Entry or Processing	11	2	—
Accounting/Invoice/Payroll	6	—	—
Assist Professional (e.g., doctor, lawyer, engineer)	3	10	—
Child/Baby Care	—	2	—
Pharmacy Tasks	—	2	—
Assist Patients/Translate for Patients/Take Vital Signs	—	21	—
Observe Procedures/Go on Rounds	—	14	—
Laboratory Work/Conduct Lab Tests	—	23	—
Varies/Unspecified	—	25	—

Note: Percents do not sum to 100 due to rounding.

The students in SBE are employed at the school site, so contracts with outside firms are not necessary. They rely on on-the-job training to teach the students how to perform their work responsibilities.

Students in the programs responded similarly when asked some general questions about school and their future aspirations. Students generally like going to school; about 60% at the MMHS and over 70% at SBE and the TCAP program like it very much (marked 4 or 5 on a five-point scale, where 5 = "like school very much"; mean ratings 4.16 [.93] for TCAP, 3.82 [.85] for SBE, 3.76 [.84] for MMHS). TCAP students were the most likely to say that schoolwork is meaningful and important (mean ratings 4.14 [.75], versus 4.07 [.74] for MMHS, and 3.59 [.96] for SBE, where 5 = "almost always"). TCAP students were also the most likely to feel that school learning would be important in later life (mean ratings of 4.51 [.69], compared to 4.13 [.75] for MMHS, and 3.77 [.97] for SBE students, where 5 = "very important"). Students in all programs had high educational aspirations. About 85% of MMHS and TCAP students and 95% of SBE students wanted to achieve a B.A. degree or higher. The SBE students were more likely to feel "very sure" that they would reach their educational goals (51% of TCAP students; 57% of MMHS; and 73% of SBE students).

Work Experiences

We observed two TCAP students working at two different construction management firms and two MMHS students working in a university research laboratory. At SBE we organized observations around activities, each involving many students. In the remainder of this section, we describe WBL in these programs. These scenarios are based on data gathered from observations, interviews, and documents collected at the sites. They are intended to convey a picture of the job in the larger contexts of work and organization. In the next section, "Learning at Work," we characterize the learning environments and describe the skills students learned in more detail.

Working in Transportation Construction

Ray begins his workday at 7:00 a.m. by filling up a mug of hot chocolate and taking it and his breakfast into the conference room.[15] Due to the cramped quarters in the building, the conference room is serving as Ray's office for the summer. Periodically, he is asked to leave the room when people need the big table for a meeting. He laments not having any privacy, but makes the best of the situation.

Before he sits down, he pulls together a binder filled with documentation and several large blueprints so that he can begin to work. His primary task for the day, and really for the whole summer, is to compare the costs charged by the subcontractor (detailer) for rebar installation with the number of rebars that had actually been installed. The paperwork in the binders provided by the detailer includes a listing of all the rebar charges, broken down to an individual level. The blueprints, put together by the inspectors, show the details of the construction, including the number and size of each rebar used in the construction. Ray looks at each rebar charge listed in the binder, then looks at the blueprint to ensure that the particular rebar had indeed been installed.

---

[15] This scenario represents working at one of two TCAP sites. In the next section, we include data from both sites.

He looks through the different areas of construction and makes a note of any inconsistencies between the two sets of documentation. He uses different colored pens to highlight the matching pairs of charges and rebars. He finishes up two of the roof areas, and is ready to move on to a third. While he has the list of charges for the third area, he cannot locate the corresponding blueprint. After searching in several locations, he asks one of the engineers where it might be. All of the engineer's suggestions are places that Ray has already looked. They eventually give up the search and agree that he can use an older version of the blueprint. Given that the roof depicted on the print is currently being worked on, they realize that one of the inspectors probably has the most current version out in the field.

Once he sits down with the blueprint and charge sheet, Ray realizes that there are too many discrepancies between them for him to continue. So he decides to wait until he has the correct blueprint to complete the task. While rebars are his primary responsibility, he has several other duties which also require his attention. He uses these other tasks as a way to break up the monotony of working on the rebar payments. When he gets tired of the rebars, he can pick one of the other tasks, such as checking the Safety Inspection Book; creating/modifying Excel spreadsheets; or, if he is fortunate, accompanying one of the engineers into the field to one of the construction sites. He enjoys being able to join the engineers in the field, and particularly likes to assist with environmental testing (both soil and water).

The one thing he is really looking forward to is the opportunity to use computer-aided design (CAD) later in the internship. His supervisor is confident that they will be able to borrow CAD equipment from another office for Ray to use. Ray wants to demonstrate the CAD skills he had developed in school and to apply those skills in the "real world."

When he stops working on the rebar payments, he decides to look through the Safety Inspection Book. This task also involves looking through two sets of documentation to identify and correct any inconsistencies. These tasks, while not intellectually challenging, require attention to detail. As Ray's supervisor says, the work does not require any particular skills, other than being meticulous in your work. The Safety Inspection Book is a compilation of information based on individual submittals that the contractor had issued regarding particular pieces of equipment. Ray looks through the inspection book to ensure that it reflects all of the modifications outlined in the various submittals.

A short time later, his supervisor, Jim, interrupts his work and instructs him to put together a chart for an upcoming meeting. Ray stops what he is doing and asks the cost engineer if he can borrow his computer since Ray does not have one of his own to use. He works on the chart for a bit, and then negotiates with the secretary to use her printer. Not only does the chart print on letterhead (because the secretary had left it in the paper tray), but the column headings print out incorrectly. He returns to the computer and laments that the office uses different software than what he learned in school. After playing around with it a bit, he is finally satisfied and prints it again—this time on white paper.

In a somewhat tentative manner, he knocks on his supervisor's door and shows him the chart. Jim immediately points to an error and chastises Ray for the imperfect work. This turns into a several-minute lecture on the importance of doublechecking one's work. Looking a bit sheepish, Ray returns to the computer to fix the chart. He struggles and struggles, but resists asking anyone else how to make the corrections in Excel. As the meeting deadline approaches, Ray keeps trying different things until finally he prints the chart up again and takes it to Jim. This time Jim is satisfied with the chart. He takes the chart, enters the conference room, and closes the door. Ray, on the other hand, decides it is time to take a break.

Interning in a Science Research Laboratory

During their summer internships in the science building basement, Shawna and James work in a warm, windowless, narrow room, in which two other students also sit at computers. Shawna is practicing her typing program. When her mentor discovered that Shawna could not type, she gave Shawna a program for practicing keyboard skills and asked her to practice for 45 minutes daily. James worked at one computer, analyzing data from spinalized rats. In the experiment he is assisting with, the researchers are testing whether training can strengthen the reflex in the rat's leg. A machine pulls the leg and the reflex pulls it back. Sensors automatically record data on a VHS tape. James' task is to play the tape and determine the exact point where the machine pulls. He marks that portion of the graph, and enlarges two seconds' worth of data corresponding to the reflex. He then stores these raw data in another file, which he will later run through a different program. James explains that the rats are trained daily and data is recorded weekly. Two of the graduate students taught him how to do this task. One used a general approach, and the other taught him step-by-step. James thought the step-by-step method was better for him. James says he worked two weeks, six hours a day, just to learn to be proficient using the data analysis programs. James is also helping take care of the rats. He puts a boot, which contains the movement sensors, on the rat's leg. This is very difficult because the rats try to bite and move around a lot. He is very animated when he talks about handling the rats—he definitely prefers working with the animals over data analysis.

The lab manager comes by to tell Shawna that her mentor is coming later in the afternoon to teach her a new procedure. At the appointed time, Shawna goes to the lab and meets Anne. Shawna puts on rubber gloves because the experiment is about RNA isolation, and RNA from her hands can contaminate the lab area and the experiment. The purpose of this study is to test a new method for isolating RNA. If it is successful, Anne can use this method to gather data for her Ph.D. dissertation. She is teaching this method to Shawna this summer in order to make better use of Shawna's time during the school year. Since Shawna will only visit the lab one morning a week, it is important to use her time efficiently. If the experiment works out, it can be part of Shawna's science fair project.

Anne begins by giving Shawna a summary of what they will be doing. The summary first explains that muscle tissue has been removed from a rat, "homogenized in lysis solution, and stored at 20 degrees centigrade. This protects RNA from breakdown by RNase." Three sets of tubes, one experimental and two control sets, are on the table. Each set contains certain liquids. Anne explains the controls to Shawna, then discusses what they will do today. The summary includes a step-by-step procedure that Shawna can refer to, if she chooses.

Anne knows that Shawna is familiar with the basic lab techniques, so she does not have to show her what to do. She watches while Shawna puts solution in the tubes, coaching her to "do 440, four times." Shawna measures 440 micrograms of lysate in a pipette, but has a problem releasing the liquid in the correct tube. Anne reminds her how the buttons work, then watches as Shawna proceeds. Shawna asks if she needs to change pipette tips. Anne says not, but to throw them out: "You only need to change them if you are going to stick the same tip in another solution." After the solutions are in the tubes, Shawna carries the tray over to the centrifuge. She puts three in the centrifuge, then realizes that it is not balanced and will not work properly. She fills another tube with water and places it in the centrifuge, with two tubes on each side. Anne watches closely as Shawna works, and congratulates her for remembering to balance the centrifuge. Anne said she purposely set up the task with three tubes to see if Shawna would remember what to do. Shawna passed the "test" with flying colors. Anne leaves the lab and tells Shawna to find her if she has any questions. Shawna looks at the instruction sheet and begins step six—"Incubate at 37° for ten minutes."

After about eight minutes, Anne returns. While they wait for the incubation time to end, she asks Shawna what she has been doing. They discuss the computer class that Shawna is taking to learn how to use the on-line bibliography at the library. She said the class was easy and now she will be able to do library searches. Anne suggests she go to the library on her own and do a couple of searches for practice. She gives her a name and a subject to search. When the incubation is complete, Anne tells Shawna to open all the tubes at once, then flip each closed as she adds the solution. This way, it is easier to keep track of which have been done. It is a good habit to get into, since some experiments will have twelve tubes to keep track of.

Later in the week, we wait in the lab manager's office while Anne rounds up the staff for the weekly basketball game. Shawna is wearing sunglasses indoors and is moving slowly. She did not come in yesterday because she said she had to cash her check and get a new monthly bus pass. Shawna and James each take two buses to get to the university campus every day—each one-way trip takes about an hour and a half. The manager playfully asks why Shawna can be so tired from just getting a bus pass. As Shawna leaves, the manager says, "I want to talk to you later." Shawna goes to the computer room to get instructions from a graduate student who she was supposed to meet yesterday. The student is not around, so she boots up the typing program. James is reading the paper, but begins talking to Shawna. Shawna types and talks simultaneously, until Anne comes in and tells them the game is about to start.

Running a School-Based Enterprise

At the SBE, student-owners sell their own salad dressing and produce from their garden. On one hot, smoggy morning in summer, the SBE appears, as usual, a bit chaotic. Students come and go from the office to the garden, the telephone rings, the water sprinkler breaks down, and a snake escapes from the adjoining biology classroom. But amid all this activity, student-owners learn the tasks associated with running a business—from weeding and watering the garden, to marketing and business planning, to dealing with suppliers and customers. Learning can happen in many ways, but most of it is hands-on. The overall atmosphere is friendly—all are on a first-name basis.

Outside in the quarter-acre garden, students and adult volunteers labor under a hot sun. Michael, one of the student-owners, arrives with a boom box, which he turns to a local radio station. Loud rap music blares out and mixes with the voices and laughter of today's garden crew. Several girls work diligently weeding the rows of vegetables and talking about the upcoming prom and the college tour that some seniors will take in the fall. Teresa, the biology teacher who helped found the enterprise at the high school, ties her dog Sophie on a long leash attached to a tree. One of the boys brings the dog a bowl of water.

Teresa welcomes a new mentor to the garden day. She introduces Andrea, a young artist, to Tasha, saying "Show her the ropes." Tasha explains that they are doing weeding, gets a tool, and shows Andrea how to use it. They begin working side-by-side. Andrea asks Tasha what grade she is in and about her college plans. Tasha tells Andrea she "looks like an athlete" and asks her what sport she plays. Later, Teresa says that she specifically connected Tasha and Andrea, hoping to make a "mentor connection." Tasha, like many of the student-owners, will be the first in her family to apply for college. She will need help filling out her college application and applying for financial aid. The SBE has about 25 adult mentors who perform various roles. For example, one mentor is a business professor who gives classes in accounting; another is a screenwriter who helps write proposals and sales brochures.

Inside the office, located in a small building next to the garden, Celia, the SBE's executive director, meets with Laura, a food vendor. Laura will be selling salads in a booth at the Los Angeles Blues Festival in Long Beach this weekend, and she wants to display the enterprise's salad dressing. She picks up several cases of dressing and some t-shirts to sell.

The office consists of one large room, divided by partitions. The first space has a table and a set of unmatched, rickety chairs, some shelves, a bulletin board, and a white board. The middle space holds the xerox machine, three computer work stations, a filing cabinet, and two shelves with materials. The third space also has two computers, filing cabinets, shelves, and cabinets with materials. Telephones, a fax machine, a postage meter, and other office supplies and equipment rest on a long table that runs the width of the room.

The white board in the main conference space lists announcements, garden tasks, or reminders about things that need to be done. The list is always changing. Today it posts a reminder from Teresa about personal phone calls: personal phone calls cost the company money, make lines busy so customers and partners cannot get through, and are not doing work [for the enterprise]. She ends by saying, "Anyone using the phone for personal reasons is stealing money from the company and therefore in line to be fired." Another item reads "Point sheets are like timecards at work." This is a reminder from Celia, who says that students can be very lax in turning in their point sheets by the end of the month. She's had to tell several of them who wanted to turn them in late that they were out of luck. She told them, "If you don't get your timesheet in at work, you don't get paid. This should be no different."

Students come in and out of the office, to get a glass of water or to cool down a bit before they resume gardening. Billy comes in and tells Celia that the mulch has arrived and they will unload it. Teresa explains that she and a team of students went to the Veterans Administration Hospital garden to learn their mulching techniques. At the last staff meeting, the team debriefed the other student-owners on what they learned. Gardeners at the VA use a full six inches of mulch to preserve moisture and to discourage weeds from growing. The student-owners decided to order mulch and try the method in one of the garden plots.

Celia sits at a computer with Illeana, teaching her how to do invoices. When she seems to understand the process, she lets Illeana proceed on her own. Celia checks back with Marya, who is compiling an updated list of the schedule for grocery store demonstrations, or "demos." (For the demos, two or three students set up a table at a grocery store, hand out samples of salad with their dressing, and talk to customers about their business.) Marya is a new student, who is interning at the SBE during the summer. Marya is having problems finding the store numbers in the files. Celia says, "Where would they have gotten the store numbers if they did not have the list?" Marya suggests the phone book, and tries to locate the numbers she needs. She calls the store and asks for the nearest cross street. Celia and Marya look at a city map and decide that this is not the correct store—it is on the right street, but at the far end of town. Celia says, "Try and think, who else would have all the stores?" Marya says, "How about the broker?" Celia smiles. She was hoping that Marya had learned enough about the business at this point to come up with a solution to the problem. She asks Marya to call the broker, and ask for the current list of the stores in this chain. First, she rehearses the conversation with Marya and gives her feedback. When Marya is ready, she makes the call and gets the information. During this exchange with Marya, Celia is still keeping track of Illeana, answering questions from other students, and looking for the keys to the van.

The following week, the student-owners hold their weekly meeting in the biology classroom adjoining the office. Teresa says she has a lot of announcements to make and asks if there are other items to add to the agenda. She announces that Vons is having a "back to school" campaign and had contacted their broker to arrange some demos. They identify twelve stores and decide to have four students doing taste-testing at each. Teresa asks Willie if he would be responsible for demo training, and he agrees to do it. Next, Teresa announces that Celia and Natalie, a student-owner, will be going to Hawaii to speak at an entrepreneurship conference. After that, discussion turns to the creation of a web page. A team from a marketing group has agreed to help them with marketing and creation of a web page. Several students volunteer to meet with the team on the following Tuesday. The meeting is suddenly interrupted by a commotion in the back of the room. Two iguanas are fighting, and Teresa goes to their cage and separates them. Once the group settles down, she discusses a meeting with Nissan, who is going to sponsor ten seniors to go on a tour of black colleges in the fall. Eligibility for this trip will depend on interest and grades. Several students ask questions about the trip. Finally, Teresa says, "I'm going to give you my teacher lecture. In September, school starts, so hit your books hard." She reminds them to sign up to take the SAT and ACT as soon as possible and to start identifying colleges where they want to apply.

LEARNING AT WORK

Workplaces as Learning Environments

What are the characteristics of WBL sites as places for students to learn? In the previous section, we provided an overview of programs and WBL activities and survey data on the types of jobs and tasks that students perform. In this section, we discuss the components of the social context that constitute "education" or learning at work gained from observations of students at work and interviews with students, employers, mentors, and others associated with the programs. As discussed in the section titled, "Conceptual Approaches and Methods," this social context influences the activities that students engage in. Because activity structures cognition, the context is important in the way it furnishes experience or guidance, thereby influencing students' learning. We begin by describing the social means by which students' main tasks are initiated, established, and processed. Then we examine the pedagogy in worksites and the community of practice that students entered and how these shape working and learning. Finally, we examine what students learn, including the extent to which WBL connects with learning in school.

Social Means for Establishing, Accomplishing, and Processing Tasks

Following Moore (1981), our perspective assumes that work-related learning is possible when a student encounters a task or problem. Other necessary conditions include an environment that provides information concerning the nature of the problem, knowledge, and skills necessary for its solution, and relevant criteria for performance. The student must engage in some action to accomplish the task and utilize available resources, including information and other individuals in the workplace. The environment also needs to provide information to the student about what is expected from him or her.

Establishing

The way a task is established indicates whether a student is highly supervised or has some autonomy and discretion over work tasks. If a student has discretion, then the job may provide opportunities to learn how to make decisions, organize one's work, and make use of the resources at hand. When students engage in autonomous activity, they are pressed into the type of thinking associated with learning. Having autonomy may also help motivate students—research on work suggests that greater job autonomy is related to higher motivation (Hackman & Oldham, 1980). Learning how to work autonomously is important for success in many jobs (Berryman & Bailey, 1992; Stasz et al., 1996).

The way tasks are established and the degree of autonomy and discretion accorded to students in carrying them out varied considerably across the three programs. Students in the TCAP program performed tasks that would be done by regular employees such as making slides for presentations or modifying legal documents. Their work tasks were often done on an as-needed basis or were incorporated into a set schedule of work. For as-needed tasks, a supervisor or coworker simply made a request to initiate a task, which had to be completed right away. These were often fairly straightforward clerical tasks such as making phone calls, copying, or sending a fax. Students were also assigned tasks with a longer time frame, which gave them some discretion over when to work on particular projects. Ray, for example, worked on rebar documentation that was updated monthly. He could work on the documentation, take a break, and then work on another task for a change of pace. Although the supervisor felt the student had little discretion—"I tell him exactly and set the priorities for him to follow"—in practice, he appeared to be a bit more flexible than he claimed. Ray said that when he finished a particular task he went to whomever requested it and asked them for something else to do. He added that since he often finishes jobs "too quickly," he sometimes runs out of things to do (see Table 4.1).

For TCAP students, work might be initiated by their assigned mentor/supervisor, or by someone else in the office. For example, a second TCAP student, Kristin, had an office manager who wanted to make sure that she was exposed to different aspects of the work. He would ask other staff to take her out to the field for an inspection or to court to hear a deposition. And the engineers also took Ray with them on visits to the construction site.

MMHS students' work was closely scheduled and monitored by their mentors. As apprentice scientists in a high-level university lab, they assisted in the various experiments conducted at the lab. The schedule for running the experiments determined the order and timing of many tasks. Thus, some tasks had to be completed in a certain sequence or at a particular time. Sometimes the schedule changed and tasks were re-ordered. If others in the lab had a task for the student, they coordinated them with the student's mentor. When students found themselves without something to do, they reported to the office manager. She gave them other tasks, such as going to the library or sending out research articles, that could be done in between experiment-related work. Overall, students had little discretion over their work. The level of student monitoring was partly due to the nature of the lab work—specific tasks, like entering data on a computer or testing for RNA in muscle cells, needed to be done in a certain way, following a certain procedure. When following a specified procedure ensures the integrity of the research, there is no room for creativity or choice. Rather, students needed to learn that work is done a certain way, at a certain time, and for a certain reason. Task establishment, then, is closely tied to the work of the lab and norms established by the community of practice, which we discuss further below.

The student-owners in the SBE had the most discretion over their work. Indeed, student-owners decided when they came to work, how long they stayed, and often what they did. The SBE established guidelines for what had to be accomplished, but students also had many choices. The guidelines consisted of a list of 27 items which primarily included activities related to running the business (e.g., basic bookkeeping, correspondence, handling orders, gardening, sales, and marketing). Each student was responsible for learning and doing every task at some time during his or her tenure. The white board in the office posted tasks that needed immediate attention such as watering the garden, completing invoices, or writing a follow-up letter to a potential funder. At weekly meetings, students could volunteer for various scheduled activities such as conducting a taste-testing demo at a grocery store. By engaging in a variety of tasks, students could determine which were more interesting to them or which complemented their talents. A student who demonstrated skill at organizing demos, for example, took charge of a group of students who needed training in giving demos. Students who found they liked to garden did more gardening than office work.

One student felt the most significant difference between learning at work and in the classroom was the level of autonomy: "Here we do stuff ourselves. In school, we listen to the teacher, and she tells us what to do. Down here, we make our own decisions, basically."

In this atmosphere of choice, however, not every student took initiative. A few students at the SBE stood out for their accomplishments and were recognized for their expertise. Other students would show up for work, but waited for someone, usually one of the adult supervisors, to assign a task. Sometimes students came to the SBE not to work, but to socialize or just hang out in a safe and friendly environment. Thus, students looking for assistance with some office task often began a conversation by asking "Are you here to work?"

Table 4.1
Summary of Learning Environment by Program

	Task Processes	Worksite Pedagogy	Community of Practice
TCAP	• Limited discretion, autonomy • Social support for task accomplishment • Clear expectations • Frequent task feedback • Feedback from work to school	• Just-in-time training for productive work • "Show and tell" approach • Broader learning opportunities at one site	• Full participation as temporary employees • Friendly, supportive toward students
MMHS	• Limited discretion, autonomy • Social support for task accomplishment • Frequent task feedback • Feedback from work to school	• Teaching mission • Apprenticeship approach • Skilled teachers available • One-on-one tutoring • Specialized curriculum • Some instruction at wrong level	• Peripheral participation as high school students • Low status • Some staff ignore students • Student behavior scrutinized
SBE	• Choice in tasks and work hours • Autonomy, discretion in some tasks • Social support for task accomplishment • Frequent task feedback	• Teaching mission • Just-in-time training • Students teach students • Mentor-led tutoring • Job rotation • One-on-one tutoring • Skilled teachers available • Outside learning opportunities	• Full participation as student-owners • Egalitarian • "Family" ethos • Individual effort can increase learning opportunities

Accomplishing

Many factors affect whether and how well a student can accomplish a task. Some tasks are straightforward and only require one to follow directions. Other tasks demand creativity. To accomplish a task, the student may have all the information and resources at hand or may need to locate them in the environment. They may need help from others or permission to use some equipment. If the student can find what he or she needs easily, then the work is easier to accomplish. Conversely, if resources are not accessible, then work can be slow, frustrating, or unsuccessful. Since other people are often resources for

BEST COPY AVAILABLE

task accomplishment, a student may need social skills to interact with others and enlist their help.

In all sites, students found the social supports they needed to learn and do their job. However, the sites differed in several respects. In the TCAP sites, where the interns were the only young people in an adult working environment, nearly all the adults provided assistance. Most of their tasks were clerical and fairly procedural, but some required creating new solutions or problem solving (e.g., creating a presentation on a computer). The students felt that their coworkers were friendly and wanted to help them. Both students worked fairly independently and felt comfortable asking questions and seeking help when they needed it. But, like many workplaces, they did not always get answers right away, and sometimes the adults could not really help them. Ray, for example, often had to search for the files containing the latest construction specifications, as they were used for different purposes and might be in the office or with the engineers in the field. Ray also used a coworker's computer and had to get permission from him to do so. If the person were unavailable, he had to wait to complete his task. Overall, any challenges the students faced in finding the resources they needed seemed normal occurrences for a busy office environment—things are not always where they are supposed to be, some resources must be shared, and sometimes it is hard to find the right answer.

Likewise, the MMHS students found assistance from many individuals in the lab. Typically, they would seek assistance from whomever was supervising a particular task. This might be their mentor, a graduate student, a lab manager, or a member of the research staff. The two students also sought assistance from each other. Once students received training, they worked fairly autonomously. However, as we discuss further below, this environment presented some challenges to students because of their social status. They were the youngest, least experienced, and least knowledgeable students in the lab, and their lower status created some problems related to task accomplishment. One student, for example, could not finish her work efficiently because someone else had taken over the computer she had been using.

Finally, students at the SBE also found many available supports and resources for completing their tasks. First, there were usually other students around who could help out. The adult supervisors were on hand to teach, coach, and assist. Since students were on their own for some tasks, it was very important for them to rely on each other. When they encountered problems while doing a store demonstration, for example, they had to figure out what to do on their own. Students sometimes ran into trouble doing some of the office work because they could not find the materials they needed or supplies had run out. In these instances, they seemed to find ways to manage, for example, by taking a trip to the office supply store or by figuring out an alternative way to get the information needed (e.g., by calling the broker for grocery store addresses when the list could not be located).

Processing

To accomplish a task well and successfully, a student needs to know what kind of performance is expected. Ideally, a student will get clear information about performance expectations before starting a task, as well as feedback along the way. Problems may arise if expectations are unclear or if the student's work is not monitored. Feedback and monitoring may be more effective if the supervisor or mentor guides the student's performance. Providing appropriate guidance can be a complicated affair, since the mentor must provide enough information and feedback so the student can proceed with the task, but not so much that it presents little challenge or no longer provides an opportunity for learning (Stasz et al., 1993). In some WBL programs, evaluations of work performance are incorporated into school-based evaluations, and students need to understand this aspect of the evaluation process as well.

TCAP students appeared to receive ongoing, albeit informal, feedback from supervisors. Ray worked on a spreadsheet, for example, which he showed to his boss. His boss identified a discrepancy and asked him to correct the problem. This particular task required several iterations of revisions based on feedback from the supervisor, so in this way, Ray got feedback along the way. Sometimes feedback was incorporated into the task, as when Kristin prepared a Power Point demonstration on the computer. Since the image changes in real time, she got immediate feedback on any adjustments made.

During the informal critique process, performance criteria was not explicit, but this ambiguity did not appear to pose any problems for students. For easy tasks like copying, the criteria is evident because a finished product results—for instance, five copies of a document are made and delivered to whomever requested them. In other cases, the necessity of quality performance was unclear, or lackluster performance did matter. In one instance, for example, a supervisor noted that while Kristin had made some mistakes editing the Power Point presentation, he was not expecting perfect performance. In discussing her work he said that anyone could make small mistakes and, besides, "she is just in high school." Nonetheless, performance remained an important issue. Both students knew that their mentor would complete an evaluation form on their performance and send it back to the program coordinator at the end of the summer. Students also complete a form to provide feedback about their work experience.

At the research laboratory, feedback was more formal and more frequent, which befitted the nature of the work and social environment. Students learned a task from a particular individual, who provided feedback and monitored their work. When the tasks were crucial to an experiment, like testing for RNA in muscle tissue, the student was closely monitored and feedback was frequent. For less crucial or easy tasks, like collecting articles from the library, feedback was less frequent and more informal.

Feedback was also provided through task processing. Working on the computer, for example, James could easily tell if his actions were correct or incorrect—if he made a mistake, the data would not appear. In lab work, feedback is often provided through physical evidence. For example, if RNA is being isolated successfully, then the RNA pellet should appear in the tube. If a procedure ends with many empty tubes, then something in the process is probably wrong. The student needed to understand the process, "but not the chemistry at the equation level," to know how to interpret the feedback.

In addition to feedback about the work, MMHS students received feedback about their behavior, especially any undesirable behavior. The lab was an active and busy environment where people work hard, for long hours. Loafing and socializing were not the order of the day. The students' behavior was frequently scrutinized by other staff, who would report any off-task behavior to a mentor or the office manager. One student said there was an "expectation to be doing something" and that "people get on your case" if they perceive that a student is not working. Students expressed some resentment that staff would assume they were loafing and "tell on them" rather than just ask what they were doing.

At the SBE, feedback was also provided in a variety of ways. Overall, student-owners could gauge success by sales volume. If their marketing pitch was successful, the store buyer would place an order. On a day-to-day basis, students looked mostly to adults to determine if they were doing a good job, but some students also provided feedback. During staff meetings, the advisor might report whether each student was doing well or what he or she needed to work on. The adult mentors frequently praised students' good work or accomplishments. In introducing students to the research staff, for example, they described their accomplishments (e.g., "Carlos is our math whiz. He went to a summer program at Cal Poly Pomona and aced his math class.").

Students who were not performing up to expectations were put on probation. This happened if the other student-owners perceived that a student was not putting in many hours, did not show up for regular meetings, or did not work very hard. The student-owners discussed such problems and, if necessary, notified a student that he or she was on six weeks probation. If the student's behavior did not improve, he or she could be dropped from the program. As one student explained, "If you're lazy, you can't be here. We don't want to fill a slot with a student who won't work."

Students also gauged their performance by the number of points earned. Ultimately, the number of points they accumulated (point equity) would determine their financial remuneration upon graduation. They received 100 points for each hour of work, 75 for attending weekly meetings, 250 for each hour of SAT preparation, and 500 points for demos. Although the number of points earned provides feedback about how much a student accomplished, point totals do not provide information about the quality of their work.

The Pedagogy of Worksites

Moore's (1981) studies of student internships found no "rational pedagogy" whereby social means, as pedagogical strategies, are matched to the task. Rather, extrapedagogical factors, embedded in the broader institutional context, helped shape the setting as a learning environment. We reach some similar conclusions upon examining the pedagogy of worksites, but also found instances where teaching strategies are carefully planned and where opportunities for learning were foremost in the minds of adult mentors. These appeared to be tied to the organizational setting and/or a particular community of practice and to the individual adults involved.

The main pedagogical approach at the two TCAP sites was "show and tell." Students received instructions to complete a task and were expected to ask questions if they did not understand. Learning was not planned, but experienced on an as-needed, or just-in-time basis. This model of training is common in industry, particularly for front-line or entry-level staff (Stasz et al., 1996; Stern, 1994).

Organizational differences also contributed to variations in learning experiences offered to TCAP students. Kristin worked in a firm characterized by organizational openness and value for training and learning; these characteristics affected her experience in several ways. First, Kristin was both permitted and encouraged to observe a range of roles in the organization. The director became overtly involved in her internship and, in keeping with the program's goals, wanted her to gain broad knowledge about different aspects of the work.[16] To accomplish this goal, he gave Kristin a special project—to interview all key staff to learn about their jobs, background, and experiences in the industry. Kristin was able to organize and carry out this task in her own way and was expected to present what she learned to the staff at the end of her internship. Although the office was fairly small, the range and type of tasks the company engaged in represented several aspects of the construction industry—marketing, engineering, planning, and inspection. Thus, she had the opportunity to learn about a broad range of activities, whether she worked directly on them or not. The director made it clear on several occasions that this project was an important part of Kristin's internship and that staff should accommodate her requests for interviews and information.

The director's interest in Kristin's educational experience paralleled with the organization's view toward learning and training. According to Kristin's supervisors, the company has a self-development program. This program is open to all employees and includes technical training within the company, lunch time seminars, and outside seminars. Each employee must obtain yearly continuing education credits. Classes are available four times a year and different full- and half-day seminars are offered concurrently. Many classes are held on Fridays, since the office closes on alternate Fridays. Staff we spoke to felt the educational programs were beneficial and planned to encourage Kristin to attend an upcoming seminar.

---

[16] Another indicator of the director's support for the program was financial. Although most of the student internships were paid with program funds, about five students' salaries, including Kristin's, were paid by the employer. This company was willing to pay for an intern because it believed in the goals of the program. Significantly, their support did not diminish even though their experience with the previous summer's intern was less than satisfactory. That intern worked very slowly and was shy; she needed to be "more aggressive to work with people."

In sum, this emphasis on training and learning helped create a nurturing environment where Kristin found ready assistance when she needed it and where many individuals paid attention to the educational activities in her internship, not just productive work activities. In contrast, the construction company where Ray worked had no such organizational training policies or practices and, except for some occasional visits to the construction site with the engineers, did not offer instruction other than just-in-time training.[17]

The university-based science research laboratory considers teaching part of its mission. The students from MMHS worked as unpaid interns during the school year, when they visited the lab one morning per week. During the summer, the interns were hired as lab assistants and paid under a special program the university sponsors for minority students. The basic pedagogical approach resembled an apprenticeship model of teaching, modified somewhat for high school students, where mentoring was very important. As one staffperson explained, "In science, mentorship is a big deal." Each student we observed had a designated mentor, and also received training from others in the lab. In addition, both students also reported to the lab manager, who checked their hours and assigned them other work to fill in between research-related tasks.

One mentor, a graduate student in the lab who was instrumental in creating the internships for MMHS students, developed several instructional activities for the summer interns, in addition to working closely with one student. From experience, she knew that the students' science background was very general and not related to the specific scientific concepts and methods utilized in neuromuscular research. To help prepare students for lab work, she developed a curriculum, including textbook readings, an annotated bibliography, and a few key research articles. She also assessed the students' skills and attempted to provide learning opportunities to help them reach higher skill levels. When she discovered that Shawna could not type, for example, she gave her a computer program for developing keyboarding skills. Shawna was required to spend 45 minutes each day practicing her typing. The mentor also arranged for Shawna to take a computer class at the university.

---

[17] Ray's work combined tasks from two regular jobs—assistant office engineer and document control person. The company does not usually train new hires for these positions because they hire people with previous experience.

As mentioned earlier, students learned the same way that others learn in the lab—they are taught a procedure or a task by whoever knows how to do it. The "teacher" can be a researcher, a college student, a graduate student, or a lab manager. The training is often planned ahead of time. The quality of instruction, from James' perspective, was uneven; sometimes it was too fast—"they are forgetting we are high school kids"; some people "get mad at having to explain again . . . others are cool and will help you out."[18]

Shawna's mentor had a good deal of previous teaching experience, although with older students, and had worked as a counselor's aide with undergraduate science majors. She used several specific teaching techniques when instructing Shawna in laboratory work. For example, she provided a "job aid" or summary of the "RNA Protection Assay" procedure. It began with a description of what had already been done, then outlined the day's procedures and described what would happen next. This summary put the immediate task in the larger context of the study and also explained the steps required to complete three procedures—(1) RNA digestion, (2) inactivation of RNase, and (3) precipitation of target RNA. Although this procedure was available in a book, the student felt the job aid presented it in simpler language and made it easier to understand.

As Shawna started to work, the mentor discussed what they had done last time and gave another example they had observed in a different lab. This review served to remind Shawna that she has seen or used these techniques before. While Shawna followed the procedures, her mentor let her do the task on her own, but closely watched her, correcting and coaching as needed. At a later point in the process, the mentor set up a "test" to see if Shawna would know what to do. The centrifuge needed four tubes to be balanced to operate properly, but the experiment only required three. She did not mention this to Shawna, but waited to see if she would remember. Shawna did remember and filled a fourth tube with the same amount of liquid to achieve balance. Her mentor praised her for properly balancing the centrifuge.

---

[18] James and Shawna had somewhat different opinions about their training. Shawna worked closely with her mentor and felt looked after. James' first mentor assignment did not work out—she decided she was too busy to supervise him—and he had to be reassigned. During the transition to a new mentor, there seemed to be some miscommunication about what he was supposed to be doing and he was temporarily left to shift for himself.

The SBE provided a wide range of learning opportunities for students, from many different sources. Students learned from and taught each other to perform many tasks and earned points for training others. The advisors admitted that students are not always good teachers. One advisor described a student-owner who was proficient at most tasks, "Tim is not a good teacher. He gets impatient and would rather do it himself."[19]

The two adult advisors primarily coached students, letting them make most decisions on their own. They also adopted one-on-one tutoring techniques, in which they gave enough information and guidance for students to proceed and would gradually withdraw assistance as the student became proficient. One advisor was able to provide guidance for several students at the same time, and also answer other students' questions. She said she works hard not to answer everyone's questions and first asks instead, "Did you try and answer that yourself?" She felt that students are not encouraged to ask questions in school and that many do not when they first begin working at the SBE. In her view, teachers were often unable to relinquish control and were inclined to "spoon-feed" students, which was a disservice to them in the long run. Eventually, students learned that the SBE is "a safe place to ask questions" and began changing their behavior. She felt that when a student began asking questions, it was a good sign that they were learning. As described earlier, the advisors adopted role-playing and rehearsal techniques to instruct students. The students also did role playing as part of training. Tina, who heads a demonstration or "demo" team, set up a practice demo in the SBE office. She played the role of customer to student trainees and asked them a lot of questions: "They [the customers] ask you some crazy questions. They want to know details about the ingredients, fat content, and other things."

There was a conscious effort on the part of the program advisors to look for learning opportunities outside the day-to-day operations of the SBE. They took advantage of the expertise of their adult mentors—one university professor, for example, lectured students in principles of accounting. In a lesson we observed, he used many specific examples directly related to their business. The advisors also looked for workshops or conferences that students might attend to learn entrepreneurial or other skills. Several students, for example, attended an entrepreneurship training program conducted by a national organization. The advisor discussed several reasons for seeking outside learning opportunities. Activities like the entrepreneurship program provided specific advantages such as offering opportunities for teamwork and learning technical aspects of product design. She said that students had little experience working in teams when they first arrived at the SBE and thus needed opportunities to learn to "network to form solutions." These experiences help make the SBE "less of a goldfish experience." Also, by sending students to an outside program, the advisors can get feedback. If attending students learned something new and useful, they taught it to other students. If the outside program did not present new opportunities for learning, then advisors felt more confident about the SBE program's content and design.

---

[19] On one visit, the advisor mentioned to this student that a new intern was in the office, which presented a good opportunity for him to "get some teaching points." She gently reminded him that teaching others was part of his responsibility.

The SBE's prominence in the community helped attract interested businesspeople who volunteered their expertise. We attended a half-day meeting with a team of students at a marketing and public relations firm. The firm arranged a series of presentations on different topics, including budgeting, investment strategies, fundraising, dynamics of marketing, and principles of public relations. They also arranged for a conference call with a store buyer so the students could give him a sales pitch. They did a dry run to help students prepare for this call. The staffperson who arranged the meeting had also been a professor, and her teaching experience was evident in her interactions with the students.

In sum, with the exception of the construction firm where Ray worked, all the sites provided purely educative experiences unrelated to the skills needed for productive work. In addition, mentors at the SBE and the university laboratory were also skilled teachers, perhaps not surprising since both were school-based worksites.

Participating in a Community of Practice

The TCAP interns were well-integrated into the work groups in their organizations. Both were seen as regular workers who had temporary employment for the summer. Both made valued contributions. Ray was an "extra hand" who could help with paperwork backlog. Kristin also performed the same duties as regular employees. Both students participated fully in office activities, although Kristin's employer offered more opportunities (e.g., all-hands meetings, training seminars).

Students at the university research laboratory had a more difficult road to participation. The community of practice was organized to train novice scientists—to "give them the building blocks for more advanced work." However, to participate fully in this community, the students had to learn to behave in certain ways. As the youngest, least experienced, and least knowledgeable assistants in the laboratory, high school interns had to prove themselves. Some graduate students or postdoctoral fellows did not want to work with them. The students recognized their lower status, which, as mentioned earlier, sometimes interfered with their work and learning opportunities.

Several reasons for the interns' lower status were apparent. First, status is typically conferred through rank, experience, or skill, which often go hand-in-hand. The chief scientist who heads up the lab sits at the top of a loose hierarchy of academic rank and experience, including senior researchers and laboratory staff (of varying academic ranks), postdoctoral fellows, graduate and undergraduate students, and, finally, high school students. There are two areas in which one can gain prestige in the lab: (1) intellectual and (2) "fine hand work." One staff member, for example, was known for "doing beautiful gels." In this environment, the only way for a high school student to achieve status is to exhibit some special talent that is in demand. Although this can happen, it is unlikely.[20]

Understanding where one stands in the hierarchy was important. Shawna spent some time trying to figure out just how everyone fit in[21] She said she was surprised, for example, to find out that one of the lab managers did not have a Ph.D. She assumed that this person had a degree because she was responsible for running a lab and had many students working for her. Shawna also realized she was "only a high school student" and, thus, did not feel entitled, for example, to ask for computer time when she needed it. She also observed that ignoring rank can get one into trouble. For example, James apparently had a habit of walking into the chief scientist's office and talking to him about his internship or even complaining when he was not permitted to do what he wanted to do. Although his assertiveness did not seem to bother the chief scientist, it did bother some other staff. James' behavior was considered "cocky" and inappropriate, and he was admonished for not "knowing his place." James seemed genuinely puzzled that others viewed his behavior as improper, which suggests that he was less attentive than Shawna to the social milieu.[22]

---

[20] We heard about one student who had achieved status through skill. He was a "computer nut" who proved valuable to the lab. Even though he was only a high school student, and was volunteering at the lab, he had no problem getting to work. This student has a standing offer for paid work in the lab.

[21] Shawna paid close attention to the social distinctions in the lab. She knew that the chief scientists were always called "Doctor," but that young, new Ph.D.s. were called by their first name. She did not always know the reasons for the different ways to address people, but she did know it was important to learn the "rules."

Students' lower status was also a product of history. The lab had been providing internships to high school students since 1989. Because high school students tend to be quieter and ask fewer questions than older students, they were perceived as lacking interest in the work. Over time, this perception stuck, causing some to ignore high school students and others to refuse to work with them. The only way for a student to overcome this reputation was to consistently behave in an "interested" way—specifically, to ask questions.

At first, Shawna, who had a quiet, reserved nature, did not ask questions. Shawna's mentor and the lab manager talked to her and explained that it was very important for her to always look interested and alert, and advised her to ask questions: "Anne told me to ask questions even when I'm on my way to the library or passing by another lab." Shawna consciously worked to change her behavior. When a researcher taught her a lab technique, for example, she said she tried to think of questions to ask during his explanation. She felt frustrated because he would often "answer my questions before I could ask them." Her strategy was somewhat successful, however, because the researcher told her mentor that Shawna was "doing better." Shawna provided an interesting explanation for her behavior—she likes to listen. She felt that "if you ask questions, then the other person might think you aren't paying attention." She added that listening, rather than asking questions, "works out in school because they don't want kids asking questions all the time." The teacher has too many students to answer all the questions. And "not asking questions means you are listening to your teacher, not sleeping in the back of class or talking to your friends." Shawna had learned an important, if somewhat ironic, lesson: "asking questions" means very different things at work and at school.[23]

---

[22] According to the mentor, the only student ever dropped from the program was "argumentative." He would disagree with what was being done in the lab. He was also only interested in "finding out the answer, not going through the process."

Although the lab held weekly staff meetings, the students were not asked to attend. Students were included in the other all-staff activity, the Friday morning basketball game. These games provided some relief to the intense pace of work and encouraged social relations in the lab. All staff, including the chief scientists, lab assistants and managers, secretaries, students, and so on, were encouraged to play. The game was not purely recreational, but more like "serious fun"—teams kept score in an atmosphere of friendly competition. The ethos in this lab could be described as "work hard and play hard."

Unlike other settings, the SBE community was defined primarily by students and by the goals of the program. An important goal of the SBE was to be student-driven. Student-owners recruited and selected new students, decided when to put a student on probation, and made many business decisions on their own. The adult advisors and mentors were available to provide assistance, advice, and instruction. One advisor emphasized that it was important to involve adults who "will give up control. Otherwise, it's a program for the adults."

In order to run the business, students had to learn to work with each other. Although this was difficult for some, the SBE provided many supports to achieve teamwork and collaboration. Students had many choices and opportunities to participate in the business activities and in activities that supported their academic achievement (e.g., SAT preparation, college tours and applications, tutoring). About 25 adult mentors volunteered to help students with all types of activities.

The SBE, then, was much more than a business venture in salad dressing and garden produce. It was a supportive environment to "build healthy, thriving kids, who will be able to leave this 'model' and still thrive." Adult advisors and mentors were just as concerned about building students' self-confidence and getting them to college as they were in making money. As one student put it, the SBE "is like a family."

---

[23] Similarly, when asked how learning at school is different from learning at work, James replied, "At school, you either listen or write notes—there's nothing else for you to do."

In sum, the work settings provided different opportunities for participation. TCAP students had "junior" status but were full participants in the community of practice. MMHS students participated peripherally, albeit sometimes for legitimate reasons. SBE students had the best prospects for full participation since the SBE established its own norms and since participation was more dependent on student choice.

What Do Students Learn?

Depending on the goals of the program and the nature of the WBL placement, students may have opportunities to learn different kinds of skills. As discussed in an earlier section, this study is primarily interested in more intensive WBL experiences that can provide opportunities to learn technical skills, generic workplace skills (problem solving, communication) and attitudes, personal and social skills, and a broad understanding of an occupation or industry. In addition, WBL that is connected to school learning may enhance motivation and academic achievement.

Student learning in each program is summarized in Table 4.2. Although we did not formally test skill acquisition, accounts of student learning are embedded in particular situations, which lends to their validity.

Table 4.2
Summary of Student Learning by Program

	Technical	Generic	Attitudes	Personal/Social	Broad Industry	Enhance Academics
TCAP	• Read blueprints • Learn new computer application • Chemical properties of materials • Basic procedures and documents	• Limited problem solving • Communicate with coworkers	• Show initiative • Be punctual • Meet deadlines • Be meticulous, careful • Be persistent	• Work with adults	• Exposure to different occupations • Interdependence of jobs in work • Understand how office functions	• Apply computer knowledge at work • Use basic math, reading
MMHS	• Lab procedures and techniques • Operate technical equipment • Computer data analysis • Technical reading • Specialized scientific knowledge • Chemistry • Math related to chemistry	• Limited problem solving • Communicate science to lay audience • Communicate with coworkers	• Be responsible • Meet deadlines • Show interest • Work hard • Be meticulous, careful	• Find place in complex social environment	• Understand broad implication of research • Understand various aspects of work as researcher • Understand how research laboratory functions	• Library skills • Advanced scientific concepts • Apply chemistry knowledge • Typing
SBE	• Business concepts: marketing, sales, accounting • Gardening	• Make business decisions • Communicate with coworkers • Communicate with outside audiences	• Be responsible • Work hard	• Work in or lead a team • Work with adults as professionals • Teach adults and other students • Social responsibility	• Understand all aspects of running a business	• Tutoring • SAT/ACT preparation • College tours • College application

Technical Skills

Since TCAP students primarily performed clerical tasks, they had fewer opportunities to develop sophisticated technical knowledge or skills. Of the two students, Ray's work on rebar documentation and assisting engineers conducting tests at the construction site, introduced him to some technical aspects of construction work and materials. He also learned some new computer applications (e.g., Excel).

MMHS students had the best opportunities to learn high-level technical skills. In running experiments, for example, the students had to master various laboratory techniques (e.g., pipetting), operate scientific instruments, and work with the computer. They also needed to learn and use specialized scientific language. For example, they knew the names of various muscles and how they worked. Some tasks provided more opportunities to learn and use technical skills than others. The computer work that James did, for example, did not, in his opinion, require much technical skill or understanding. He said once you learn the procedure for recording data from the computer, and can "push 'play' on the VCR . . . that's about it." He said he can do what he was taught on the computer, but did not really understand it. If some problem arose with the program, "sometimes only the person who wrote the program knows how to fix something."

Other tasks, such as testing a method for separating RNA from DNA, required more technical competence. The task required developing psychomotor skills such as pipetting and handling tubes with gloves. Shawna also learned to operate equipment, like the centrifuge and incubation bath. She had to understand the process very clearly in order to avoid costly mistakes. Since experiments are run under varying conditions, she needed to learn when to change or not change pipette tips—that is, when contamination is possible and when it is not. She had to calculate tiny measurements (micrograms), know what solution to place in each tube, and keep track of the tubes and different experimental conditions. According to her mentor, while the task is relatively easy once it is learned, understanding the purpose of the task is complex. According to the mentor, "it takes about ten repetitions to become proficient at using the pipette and other equipment." Mistakes could be costly—one kit of solutions costs $350. One pipette in the wrong tube could contaminate the solution and ruin the kit. If that happened, the kit had to be thrown out.

SBE students had the opportunity to learn many skills related to running a business. These included gardening skills (operating equipment, techniques for mulching); knowledge about ingredients and nutritional properties of their products; and principles and concepts associated with sales, marketing, distribution, accounting, and so on. In addition, students learned computer skills and how to operate various office equipment (e.g., fax, postage meter).

Generic Skills: Problem Solving, Communications, Teamwork

Problem Solving

When we discussed problem-solving skills with mentors associated with TCAP, they spoke about problem solving in a particular way. The tasks students had, such as rebar documentation or creating Power Point presentations, did not require much problem solving in themselves. However, students did need to know how to deal with a variety of problems that arose, for example, finding the information they needed to complete a task. As one mentor explained, students have to think "how can I do it and not ask someone else." Their description of problem solving, then, means that students need to be resourceful and independent. Both students exhibited this type of problem solving during our observations (see "Conceptual Approach and Methods" section). The following excerpt from the field notes illustrates the type of problems that one student encountered and how he used resources in the environment to accomplish his task:

> Ray finished checking 7 and 8 and was ready to move on to roof 5. He had the detailer's list, but not the plans for roof 5. He looked through a stack of blueprints in the inspectors' office but couldn't find the correct one. He poked his head into the lead inspector's office, asking him where the print might be. The inspector was a bit abrupt with him, but told him where it should be. Ray replied he already had looked there. The inspector suggested a couple of other places to look, but also said that it was likely that one of the inspectors had the map out in the field with him, since they are currently working on that part of the project. Ray searched through several piles, but without success.
>
> Ray then went into Bob's office and borrowed a book that listed all of the plans and what folder they should be in. When he took the book, Bob asked him what was going on. Ray explained the situation and Bob said, "give me a holler if you can't find it." Ray determined where the plan should be, pulled the appropriate file folder and found the right plans. Unfortunately, this iteration of the plans had not been approved by the inspector yet, so it was possible that changes had been made which weren't noted on that copy.

> Bob came out of his office and told Ray to use the unapproved version for the time being. "When the approved plan comes in, just doublecheck where changes have been made." Ray went through the two sets of copies comparing the numbers. He could tell from the detailer's list that numerous changes had been made, and he decided it wasn't worth trying to do the cross-check at this point. He needed the final, modified plan to be able to do the job right.

Mentors and students at the university research lab described problem solving a bit differently. Although problem solving is a basic process involved in laboratory research, the students were not required to solve such problems. As Shawna explained, "I sometimes problem solve in doing the procedures, but it's not about the research." Similarly, James encountered problems with his computer analysis task, but the problem concerned the computer program, not the research itself. These students were required to solve problems similar to the TCAP students. The problems encountered were primarily procedural, and if students got stuck, they needed to use resources in the environment to carry on with their task.

Students might have an opportunity to solve science problems while conducting their science experiment, which is a required part of their school curriculum. However, neither the students nor the mentor believed that this project really helped advance their problem-solving skills.[24] Since students worked on the science fair project during the school year, their main activity during their weekly visit to the lab was the science fair project. James said the science fair project was "handed to him." They were assigned a topic and shown how to gather data. The student analyzed the data with help from lab staff: "They check up on you and you get to ask questions." The student handed in a written report to the science teacher, which was read at the lab "because they read everything that goes out of the lab." Sometimes, "they scratch everything out and write it themselves." Even the mentor admitted that the science fair project has become a bit of a joke at the lab because students did not choose the project and they were "walked through it." She said others would ask her, "How did you do in the science fair this year?" Ironically, the science fair requirement appeared to conflict with the students' opportunity to do "real" science in the lab.

---

[24] The mentor felt that students generally lack problem-solving skills when they come to the lab: "They seem to have the knowledge and ability to solve problems, but lack the confidence to try." She also observed that, in her opinion, undergraduate students are also less prepared than in the past, but did not know why this was so.

At the SBE, students were encouraged to think about how to solve problems—adult staff were there to advise and give feedback. Many problems were procedural such as locating the grocery store addresses (see "Conceptual Approach and Methods" section). One student described another situation when they discovered that their salad dressing was not on the shelf at five stores they had arrangements with. A team of students called a meeting with their broker to find out why. Several problems that students encountered were quite challenging and required a team effort, as illustrated in the following example:

> Unbeknownst to the students, the marketing and public relations firm had arranged for a buyer to call during their meeting so that students could "make a pitch." Ms. Green, who arranged with the grocery store buyer to call in at 1:00, suggested that they prepare for the phone call. Student-owner Tim started saying his usual presentation, but the SBE advisor and the firm's staff interrupted him. The presentation was to occur during a conference call, which would not support the visual format that Tim was used to. He needed to adjust his remarks to work without visual props. The other staff helped the students to structure their remarks. They wrote notes on the big pad of paper and outlined an introduction, background, description of their products, pricing, sales volume, etc. The group had a lengthy discussion about each of the points and what the kids would say.
>
> The students negotiated who would speak. Two students, who their advisor referred to as "the anchors," and two other students (of five) divided up speaking responsibilities. The staff offered some advice about how to do a conference call (e.g., introduce yourself before you speak, say that "now so and so will be speaking," don't make any unnecessary noise). With a staffperson acting as the buyer, the students did a dry run. It did not go well, and two students admitted to being very nervous. The students decided to change seats to make it easier to read the notes. They went through it again and [it] went slightly better.
>
> At 1:15, Ms. Green came in to say that the grocery store buyer was on the line. They hooked the call up, and the kids began. This time they did a great job. Tim began by introducing the group and saying a few things about the SBE; Marcus described their product line; Benita talked about prices; and Mary discussed consumers to whom [their product was] sold, sales volume, and the company's mission. The buyer asked several questions, all of which Tim answered. The buyer mentioned that honey is a declining market, and he asked why they chose honey mustard as their new flavor. Tim said that they brainstormed and came up with the idea of making it a no-fat dressing. Tim added that theirs was better than other honey dressings on the market.
>
> The buyer closed by requesting two samples of each flavor and all the information they have about the SBE: "The more information the better." He gave them his mailing address and his position—ethnic and gourmet category manager. After the call, the staff and SBE advisors praised the

> students' performances. It was clear the kids felt good about themselves. There was some discussion of next steps, and one student agreed to put together the packet of information to send to the store.

In this example, students worked as a team, with advice and coaching from the adults, to convert a face-to-face presentation to a telephone presentation in real time, under a tight deadline.

Communication

A traditional way to analyze communication is to consider four aspects: (1) audience (who is communicated with), (2) purpose (why they are communicated with), (3) style (the way in which the communicator presents him or herself), and (4) mode (the means by which communication is accomplished) (Kinneavy, 1971). This framework provides a way to describe the kinds of communication required at work and the opportunities for students to develop different communication skills.

The TCAP students primarily communicate with internal audiences, including coworkers, other staff, and supervisors, but Kristin also spoke to customers. These communications were typically face-to-face, sometimes in meetings, and occasionally over the telephone. In addition, both students worked with written records or forms. And both used computers to record and display information. The main purposes of their communication was to elicit and provide information or to clarify instructions. The style of these communications was friendly, but professional. The mentors felt the most important communication skills were telephone skills (for Kristin) and verbal communication with coworkers (for Ray).

MMHS students also communicated with an internal audience—staff in their lab, other labs, or the library. Most communications were face-to-face, and asking questions was very important. The main purposes of communication were to elicit and provide information. Students kept written records of the experimental procedures. The mentor felt that students have communication skills, but don't display them. Most students are quiet and "need to be drawn out."

MMHS students were also taught to present their science fair projects. The mentor had heard from science fair judges that many students cannot answer the questions put to them because they do not really understand the material or did not do their own work. So she emphasized presentation, even though students may not actually present the project at the science fair. Nonetheless, she felt it was important for students to be able to communicate what they did to lay audiences, since the science is complex and the topic specific.

SBE students communicated with internal audiences, including other students and adult supervisors and mentors. Unlike the other programs, working in the SBE involved frequent communication with external audiences as well. Communications with internal audiences were primarily face-to-face. Communications with outsiders were face-to-face, by telephone, and by fax. Students also had opportunities for public speaking at conferences or with the media. Written communications included business-related forms, such as invoices, and may be computer-based. Students also needed to write many business and thank-you letters (e.g., to the gardeners who taught them mulching techniques). The purposes of communication were also quite varied. Students gave instructions, made decisions, and provided information. At demos, students had to persuade customers to try their salad dressing, if not actually buy it. And they had to persuade store buyers to stock their product. In the office, the style of their communications was friendly and casual, which suited the casual atmosphere at the SBE.

Teamwork

Except for the SBE, there was little opportunity for students to work in teams. TCAP students primarily worked on their own. When they did work with others, it was often a teaching situation and sometimes a collaborative effort (e.g., Ray assisting an engineer with environmental tests). Individual tasks, like the rebar documentation, were sometimes part of a larger process involving other individuals, but each worked individually on separate parts of the process.

MMHS students' work was also interdependent—independent research tasks form separate parts of a larger process. This work organization is typical of a science lab where a large study is comprised of separate, linked projects.

At the SBE, several activities were organized as team activities, with one student sometimes acting as team leader. Students could choose which teams they wanted to work on. A team of two students, for example, usually conducted "taste testing" demos at the grocery store. Sometimes three or four students would be on hand for a demo, so that each student could take a break for lunch or relaxation. A demo might last four or five hours, with students standing the entire time. As discussed earlier, marketing, sales, and even gardening activities were accomplished through teaming. Unlike more formal teams, where roles are sometimes determined by rank or expertise, the SBE teams were egalitarian. Students often distributed the work by discussing it among themselves—as in choosing roles for the sales call—or by just pitching in.

Work-Related Attitudes

Work-related attitudes and dispositions, also referred to as personal skills, include work habits and personal qualities that are crucial for success on the job. A TCAP mentor said students learn primarily what he described as the social aspects of work: "They can see discipline at work. Habits of being on time and working through the hours they are paid for. Work is a team effort, and all are needed to participate." Students must "be punctual, communicate, and watch." Students' views and behavior suggested they learned these lessons. Ray worked meticulously and persistently to get the information he needed for his main documentation task. Kristin's mentors said it was important to be aggressive, motivated, and ambitious: "Can't be intimidated working as a female in an all-male office." They were happy with her behavior, describing her as "on the ball" and a "go-getter." Kristin also noted that even though the atmosphere was "friendly and fun," it was important to "get serious and focus" when a job needed to be done.

At the science lab, students said it was important to work hard and be responsible because others are depending on what you do. The students' tasks were central to the work of the lab, since they worked with real data that would eventually be incorporated into published articles. Both students said they learned to work carefully and meticulously, and our observations confirmed this. James talked about needing to be "tedious" and "careful" to write down everything when doing an experiment or working with data. Neatness was very important in a lab and was the expected norm for lab behavior. Sloppiness could cause accidents or ruin other objects in the lab (e.g., one chemical reaction could destroy a painted surface). As mentioned earlier, a procedural error could result in ruining an expensive test kit.

The mentor at the lab added that students needed to be reliable and on time. Typically students were not very punctual. James said it was important to "be on time." Shawna learned "it is important to call them when you're not coming in":

> Work is a daily routine . . . can't say, "I just won't go in today." When you're in school you can do that . . . just skip when you don't feel like going.

Shawna also learned to speak up—"Anne tells me a thousand times." Shawna discovered that "work does not have to be that serious," but she also learned what it feels like to have a boss: "You can't be fired at school, but you can be fired from work." James learned to "be patient and don't let anything get to you."

While TCAP and MMHS students worked in environments where punctuality was important, the SBE was much more casual about time. The SBE was open from 3:30-6:30 p.m. after school and had longer hours on weekends and during the summer (but usually did not open before 10 a.m.). Much of the time, students determined their own hours. Students wandered in and out of the office and sometimes during scheduled meetings. Except for outside professional meetings, the SBE students did not have to conform to dress codes at work (as TCAP students did). Some SBE students had to be reminded when to dress formally, so were not always properly attired.

Since the SBE lacked some aspects of a real workplace, the students did not have the same opportunities to develop the same kinds of work-related attitudes that TCAP or MMHS students learned. However, the SBE did establish specific "rules" that students had to learn to adhere to. These rules were often posted on the white board in the main office space—for example, "Anyone using the phone for personal reasons is stealing money from the company and therefore in line to be fired"; "Point sheets are like time cards at work." The SBE advisors expressed frustration at having to remind students to turn in their point sheets on time, and told some they were out of luck: "If you don't turn your time sheet in at work, you don't get paid. This should be no different."

Excuses are another problem that advisors had to work on. The students had "lots of excuses and don't understand why the excuses don't work." Students believed that as long as they had a good excuse, then everything would be fine. The advisor felt that students learned this lesson in school, where accountability is lax—"Kids' excuses work at school."

When asked about work-related skills or attitudes, the students emphasized having a positive attitude and being willing to work. Students who were not productive members of the SBE could be put on probation or dismissed. In admitting new students to the SBE, the internship period provided an opportunity to gauge a student's interest and willingness to work before he or she became a regular student-owner.

Personal and Social Skills

Although students' jobs did not always require teamwork, they always involved interactions which called upon their social skills. TCAP students were the only young people in the offices where they worked. It was important for them to get along with their supervisors, who were evaluating them, and with coworkers who helped them learn the ropes. Everyone in Kristin's office was friendly toward her, and her outgoing personality suited the office. Ray's situation was a little more complicated. Two people acted as his mentors—one was warm and very supportive, but his supervisor could be gruff and short-tempered at times. However, Ray did not seem bothered by his boss's behavior and had no problems asking people to help him. Both students basically arrived at their WBL sites with social skills well-matched to their work situations.

On the personal side, both students felt confident in their capabilities. Ray was using the experience to help him decide whether to go into engineering or law. Kristin learned how to "cope with different situations and to feel comfortable in new situations" and felt prepared for work in the future—"If you took a non-TCAP student and me, I would excel in every way."

Developing appropriate social skills was more challenging for student interns in the university research lab. They depended on others to train them. The lab environment was a complex social system in which high school students were often viewed with suspicion, and their behavior was closely scrutinized. One mentor felt that the social aspect of working in the lab was very challenging—it required "getting over being a high school student." She felt that most students were not very successful at this. As discussed earlier, both students worked to understand the social rules—for example, ask questions to show interest, but do not put yourself forward too much. When students were asked about skills needed on the job, one said it was important to be patient and "don't let anyone get to you." When someone "tells on you," you have to realize that "misunderstandings happen."

In addition to learning social skills, James felt the experience helped his career exploration. The internship provided an "up-close experience, which makes you really think about it more." He originally thought he wanted to be a neurosurgeon, but now is thinking about cardiology or law.

The SBE students developed social skills to work together in teams and to solve problems at work. They also needed social skills for interacting with external audiences, in dealing with adult clients and customers. SBE students often come into contact with people from very different backgrounds than their own, so they must be able to interact with a diverse group of people. The advisors and students felt there were few opportunities in school for students to learn to work together. One student said she took part in the "leadership program," which gives students opportunities to work on committees. But only 30 students could participate in this program each semester.

The SBE aimed to build "healthy, thriving human beings who will leave this model and still thrive." Building students' self-esteem and confidence and teaching them "to respect themselves and other people" were as important as learning to run the business. Students were encouraged to try new things and to push themselves. One student, for example, reported that she was very shy when she first came to the SBE. The advisors and mentors really supported her and helped her overcome her shyness: "Now I don't mind public speaking at all." Other students said the program helped them think about going to college and about their career goals. As we discuss in more detail below, increasing academic achievement is a main goal of the SBE.

Broad Career/Industry Knowledge

All of the students expressed a broader understanding of a career or industry from their WBL experience. Kristin was given a special assignment to interview all the staff to learn about their particular job and the education it required. This project gave her a broad perspective about various jobs associated with the transportation construction industry. Ray learned that many individuals contributed to documentation and other paperwork.

MMHS students gained an understanding of the work of professional scientists and how the work in the laboratory contributes to real-world problems: "Being a scientist is not all it's cracked up to be if you're not a writer. I did not realize that so much of the job was writing articles to publish." Students could converse knowledgeably about the work they were doing, its connection with the lab and scientific purposes.

SBE students had opportunities to learn "all aspects" of their enterprise, from hands-on gardening, to marketing, sales, invoicing, and all the large and small tasks associated with running an office. The task list provided a way to ensure that students indeed had exposure to a wide range of activities.

Connections with School Learning

Since the TCAP interns work in the summer, there was no direct contact between teachers and employers. A program coordinator found placements for the students and worked with employers. She attempted to prepare students for their work experience by providing some orientation workshops. Kristin said these sessions covered such topics as "how to dress, how to act, and how to go into an adult environment." She felt well-prepared for her work assignment. Both TCAP students had specific computer skills or technical skills (familiarity with blueprints and plans) that applied directly to their work assignments. When asked, they provided several examples of how school learning and work learning were related to each other. Ray, for example, felt that some math he learned at work would help with higher-level classes at school. Kristin felt the school program had helped her learn to be responsible and to work with others. Students also had skills that employers could not make use of. Ray had experience using CAD, but the office he worked in did not have it. They hoped to install CAD equipment before the end of the summer, but at the time of our visit Ray could only look forward to this possibility.[25]

---

[25] The survey data corroborate these impressions. Students were asked how much they agreed or disagreed with the following statements about their job or internship: What I learned in school helps me do better [on the job], with 1 = strongly disagree and 5 = strongly agree. TCAP students were significantly more likely to claim that school learning supported work (mean scores: TCAP, 4.27; MMHS, 3.65; SBE, 3.50).

The TCAP coordinator felt the connections were "not strong right now," and had plans to improve them. Since career exposure is an important goal of the program, she hoped to get more placements at architecture and urban planning firms; most current placements were in engineering firms. Although she tried to get employers to develop specific work plans for students, most did not. The coordinator was working on a business outreach plan that included more formal arrangements with employers such as work plans, enhanced mentor training, and the like.

The MMHS students did not feel well-prepared for either the technical or social aspects of their work experience. The mentor said they did not expect the students to know the specialized science knowledge related to their work; it was her job to teach them. They did have opportunities to apply school learning on the job, particularly if their lab work involved chemistry (as Shawna's did). But the science they learned on the job was much more advanced than high school-level science, so, if anything, it might help when they get to college. If they major in science at college, their experience might help them get a job in another lab.[26]

In theory, the MMHS students' science fair projects might serve as a means to coordinate school and work. In practice, however, the project seemed to interfere with the students' opportunity to participate in real science research. The science fair project had specific requirements and deadlines, which were not always easy to adhere to. For example, the lab research involved animals, but the science fair guidelines stipulated that students could neither handle nor kill animals for their projects. They are, however, permitted to use animal tissue obtained from other projects in the lab. When Shawna proposed a project that used animal tissue, the science teacher at first objected on the grounds that it "seems cruel to animals." Shawna and her mentor provided more information to the teacher, who eventually gave her approval.[27]

Since the students only visited the lab three hours a week during the school year, it was difficult to meet all the science fair deadlines on time. James had science class first period on the day he went to the lab, so he wanted to skip class and go right to the lab to have more time to work on his project. Even though class time was used to work on the science fair projects, he said the science teacher would not give him permission.[28]

---

[26] Lab staff tried to keep in touch with students after graduation and mentioned several students, including James' sister, who went on to college. This lab's reputation and the chief scientist's professional network have been influential in helping former MMHS students get internships or jobs at college.

[27] The mentor pointed out that this lab followed very strict rules about the use of animals in federally funded science research and was very sensitive to animal rights issues. In this context, the teacher's objection seemed based on personal opinion rather than any knowledge of the research process.

A third drawback concerns the level of science work done in the lab. Their work was very specialized and, since students have placements in addition to this lab, it would be very difficult for the science teacher to connect the curriculum to all these possible experiences. The mentor worried that the science fair projects also remain unconnected to the "grander issues of science." She believed that unless students were interested in these grand issues, it was hard for them to be motivated to do everyday lab work.[29]

While work in the SBE was also unconnected to school classes, the program was dedicated to improving students' academic skills and expanding their educational horizons. This was accomplished in several ways. When the advisors identified a student who did not have the math skills to do bookkeeping or the English skills to write a grammatically correct letter, they arranged for tutoring with one of the volunteer mentors. Tutoring was available for any school subject (students must maintain a C average to stay in the program) and for ACT and SAT preparation. Students received points for preparing for and taking the SAT, which provided an extra incentive. Advisors tried to identify a mentor who would work one-on-one with a student to complete the college application process. Most students and their parents were unfamiliar with applying for financial aid, even though most would qualify. Advisors were very careful to find mentors who would encourage and support students' academic aspirations. The advisors also reviewed students' schedules every semester to make sure that they were taking college-prep classes. In the past, they discovered that counselors were not always advising students well.[30]

---

[28] We did not speak to the teacher or school to hear the other side of this story. But from James' perspective, school rules hampered his ability to meet the science fair deadlines, which, in turn, did not allow him to take full advantage of his internship.

[29] The mentor's concern was partly due to her goals for the program. She and the chief scientist wanted to expose minority students to science "in a way that will interest them, not drive them away." From the school's perspective, the intent of the internships was career exploration, and according to the students, the internship did help focus their career goals.

[30] According to the advisors, some student athletes in the SBE were affected by the recent NCAA eligibility rules. They did not have all the high school courses they needed to play in college and were caught offguard. Sometimes the coaches directed students to a few local colleges, rather than help them consider a broader range of educational options.

The mentors also made important contributions to academic learning in addition to tutoring. One mentor, a business professor at a local university, gave lectures on accounting. He also organized a summer program at his university where several students stayed on campus and took college courses.

We found the amount and level of discussion about academics striking. SBE student-owners often talked about their classes and teachers and the colleges they were considering. They discussed their future aspirations and debated whether their friends were making the right choices. The program was evidently successful in raising academics: nearly all of the student-owners went to college, compared to fewer than half of the students enrolled in the same high school.

Summary

This section sketched the range of learning environments in WBL programs and the opportunities different programs present for learning. It raised several issues that educators and policymakers committed to WBL might ask of their programs: What is the social context of the worksite(s)? How might different students be accommodated in them? How can we better prepare students for WBL? In the next section, we explore some of these questions.

CONCLUSIONS AND IMPLICATIONS

This study seeks to understand work-based learning by characterizing the social context of students' work experiences and the opportunities to learn a range of knowledge and skills. This study also demonstrates that work context plays a vital role in shaping students' learning experiences, by examining certain characteristics of the work context—the social means by which tasks are initiated, accomplished, and processed; the pedagogy of worksites; and the community of practice. The analysis shows that work settings and, consequently, students' learning opportunities, vary considerably. The differences in the social context discussed here have implications for the design and delivery of WBL programs. Although the sample size in this exploratory study is too small to generalize to the vast variety of WBL experiences that students encounter daily, the study provides many insights about teaching and learning at work. We hope this research stimulates and informs program designers and other practitioners involved with WBL.

Future research might examine other aspects of the social context more closely. The idea of guided learning, for example, is of interest in workplaces and educational institutions, as the amount of direct or indirect guidance is an important dimension of learning through participation. Future studies might assess student learning more directly or determine more precisely how knowledge and skill develop within goal-directed activity.

In the remainder of this section, we first briefly summarize our main findings, then offer some implications and issues for further consideration.

Conclusions

Social Means To Support Tasks Vary Considerably

Our analysis of workplaces as learning environments shows, first, that the types of tasks students engage in and the means by which they are established, accomplished, and processed, varies markedly across the three programs. The SBE gives the most latitude to students with respect to choosing work tasks and even work times. Work at the other two sites was more closely monitored and scheduled, but all students had some leeway over the sequencing or pace of their work within a specific time frame.

By and large, the tasks students had to accomplish required little creativity, although a few SBE students had opportunities to be creative. Most of the time, students simply followed directions to complete a variety of tasks. Their coworkers, supervisors, or mentors provided the social supports students needed to learn and do their jobs.

Although students received ample feedback on task performance, they were not always sure what was expected of them. Some tasks, particularly computer-based work, provided real-time feedback that could help students gauge their own progress. Successful completion of simpler tasks, like copying, was self-evident. TCAP incorporated formal evaluation procedures between the worksite and the program, and students were conversant with the frequency and nature of the assessment process.

Rational Pedagogy Is More Prevalent in School-Based Worksites

A second characteristic of the learning environment concerns the pedagogy of worksites, in particular, whether teaching strategies were based on students' needs or on other factors. Not surprisingly, training for the TCAP students, who worked in private, for-profit companies, followed a "show and tell" model. This approach seemed suited to the students' primarily clerical work. One firm was also dedicated to training and staff development, and its intern had more learning opportunities unconnected to productive work.

In contrast, the MMHS students were apprentices in a university science laboratory where teaching is embedded in nearly every activity. In addition, the mentor had extensive teaching experience and a strong desire to help minority students pursue science careers. She created a curriculum tailored to the students' needs and displayed sophisticated teaching skill. Likewise, the SBE advisors had a strategy for teaching students the skills they needed to make a positive contribution to the business and, more generally, to be successful in academic pursuits and in life. To accomplish a variety of teaching and training goals, they utilized a talented mentor pool, outside conferences or workshops, free advice from experts, and opportunities to practice in a fail-safe environment. The adult advisors were also experienced, skillful teachers. Where rational pedagogy is more prevalent, the educative purposes of WBL are as prominent as purposes tied to productive work.

Students Participate Fully in Some Communities of Practice

The communities of practice that students entered were also strikingly dissimilar. The TCAP students were junior employees and, for all practical purposes, treated as such. They were there to make a productive contribution to the work and were included in all business activities appropriate to their position. MMHS students had a more difficult time fitting in, as they lacked status in the research laboratory and had no real means to acquire it. To be successful, they had to interact in a complex, sometimes unfriendly social environment. They were included in social activities, like basketball games, but not in the weekly meetings that dealt with the lab's program of research. They were peripheral participants in this community. The SBE students created their own social environment, with guidance from their advisors. Student-owners were decisionmakers. Adults were carefully screened to select those who were willing to relinquish control to students. The

SBE students worked in a nurturing environment, where their biggest social challenge was to learn to work with each other.

WBL Experiences Provided Opportunities To Learn Many Technical, Personal, and Social Skills and Work Dispositions

Of the three sites, the MMHS students were most challenged—they had to learn highly technical knowledge and skills and identify their place in a complex social milieu. Students in the other programs were less challenged socially, and their work was not always demanding. SBE students could develop fairly sophisticated technical skills, if they so chose. All students learned valuable personal lessons about their current career interests and their capabilities.

Students also learned a lot about what it means to work. They learned to take responsibility, to work hard, to meet deadlines, and to be persistent. They learned how to dress and act appropriately to their work situation. The more relaxed SBE environment did not provide as many opportunities as other worksites to develop some valuable work habits, such as being on time or knowing when to dress more formally.

Opportunities To Learn Problem-Solving Skills Varied with Job Requirements

Students engaged in rich problem-solving activities, albeit differentiated by the requirements of the particular job. By and large, students' jobs did not require problem-solving skills around substantive, technical matters. Most of the problems students encountered had to do with the procedural aspects of their work and were easily solved by themselves or with assistance from others. Although the MMHS program's science fair project might have been an opportunity for students to engage in more substantive problem solving, it was unfortunately structured in such a way that students did little of the work on their own. SBE provided some interesting problem-solving events, but these were not available to all students. Since students decide which activities to volunteer for, and since it is hard to tell in advance where complex problems might emerge, the opportunities to develop some skills are left to chance.

TCAP and MMHS students worked independently, for the most part, but learned about job and task interdependencies. Students in the SBE developed some teamwork skills, although teams were loosely organized and their makeup varied across activities.

They also utilized a broad array of communication skills because they had more interactions with external audiences and had to communicate for more varied purposes than students at other worksites.

WBL Experiences Provided Opportunities To Learn about an Industry

The TCAP and MMHS programs had explicit career awareness or exploration goals and, judging from these worksites, students enhanced their understanding of the transportation and science fields. Individuals at the university lab also had a strong interest in motivating minority students to pursue science careers and, in some ways, went beyond the program's more modest expectations. Although the program views students as volunteer interns, the lab had an interest in turning them into productive assistants and to make more effective and efficient use of their time during the school year. By engaging the students in the research and teaching them enough about it to spark their interest, the mentor hoped to motivate students to seriously pursue science. At SBE, students had opportunities to learn all aspects of running a business, but we were not able to determine how many students took advantage of them. Unlike the other programs, which are of shorter duration, the SBE students are involved in the program for up to three years.

WBL Experiences Had Weak Connections to School Learning

Since school-based learning and WBL are meant to complement one another, we hoped to see stronger links between school and work. The TCAP seemed to do a good job of preparing students to enter the workplace. They conducted workshops for students to help them adjust to an adult working environment, and the school program gave them solid skills that employers could use. But since the work experience is not concurrent with school, the students are left to make these connections on their own. Fortunately, the two students we observed were able to do so. In addition, our survey data shows that TCAP students reported a stronger connection between school and work than students in other programs. In this case, then, school learning appeared to enhance work. To determine how work enhanced school, we would need to follow students back into the classroom after their work experience.

The MMHS program incorporated several structural features for connecting school and work. For example, the program had agreements with resource sites that listed learning objectives for students, and students were required to write journal entries about their work experiences, which teachers collected. The situation was a little different for the students working in the summer, since they were paid employees, not volunteers. The lab work was so advanced that students had little prior knowledge from their school science classes, but found some opportunities to apply math or chemistry knowledge. Somewhat ironically, the science fair project requirements took precedence over real experience. In this case, work appeared to enhance school learning, but was otherwise unconnected to it.

The SBE was perhaps the best kept secret at the high school. With only 40 students participating, from a student body of about 2,500, it is perhaps not surprising that a career counselor we spoke to did not mention the SBE when we asked her about WBL opportunities for interested students. The SBE was also the only program of the three we studied where students did not receive some kind of curriculum credits. The only teacher connected to the program was one of the SBE's original founders. It does not receive school or district funds. Indeed, the enterprise's primary connection to the school is its location on school property. Although the students' school classes were not connected in any way to the SBE, the SBE strongly supported academics. By joining the SBE, students could be tutored in any subject, receive preparation for SAT and ACT testing, and get personal assistance to apply to college. Doing well in school and raising academic aspirations were as important as running the business. Indeed, some of the program's activities to assist academic achievement were in place to make up for shortcomings in the school program. The SBE clearly enhanced school learning and overall academic achievement.

Implications and Further Questions

Overall, we conclude that most of what we learned in examining teaching and learning opportunities in these programs was quite positive. The longer-term, fairly intensive WBL experiences studied here provided opportunities for students to learn many work-related skills and attitudes. Students were generally satisfied with their work experience, although, on average, felt work was not very challenging. Although the programs varied with respect to opportunities for learning specific skills, the WBL experiences generally met each program's goals. However, the study does raise some questions and implications that we offer not as criticisms of the programs we studied, but as general lessons to consider when developing educationally valuable WBL opportunities for young people.

Make Sure Students Are Work Ready

In order to adequately prepare students for their work experience, it is important for program staff to understand the social context of the WBL setting. In settings where students are expected to do productive work, such as TCAP, they should be adaptable to just-in-time training and have the social skills to learn on the job such as asking questions or requesting help. Students' attitudes and dispositions toward work are perhaps more important than technical skills, since the jobs they are given are not very demanding to learn and do not require specialized skills. In this environment, to be successful, students must be energetic, meticulous, and sociable. Students who are shy or slow in their work habits are less successful.

Other settings may combine educative and productive purposes. MMHS students have little knowledge when they come into the lab, and it is the responsibility of lab staff to teach them. Their goal is not only for students to contribute to the research but also to appreciate "big science" and to become interested enough to pursue a career in science. In this environment, students must be willing to work hard to learn sophisticated concepts and techniques and, most important, learn to navigate in a complex social system. Again, even from this employer's perspective, attitudes and dispositions are more important than technical knowledge—a successful student will be interested and ask questions and will behave in ways appropriate to his or her status.

Match Students to Social Context of Work

A corollary to preparing students for work is to carefully match students and worksites. Program coordinators spend a great deal of time getting to know employers so they can maximize employer satisfaction. A good experience with a student is often the best selling point for a program and the best way to keep employers involved. Although this suggestion may be self-evident, even those coordinators who worked closely with employers did not always make a good match. At one TCAP site, for example, the previous summer's intern did not work out at all—she was too shy and she worked too slowly. In this case, the employer expressed dissatisfaction, and the coordinator made a more successful match the following summer. According to the MMHS students, they were sent to the university research lab because they had the highest grades. However, grades obviously matter far less for success than a student's ability to pick up social cues and learn how to behave in a complex social situation. Since SBE operated over a longer time frame, it could use a trial internship period to weed out any students who did not fit in. In all cases, program coordinators might make better matches by considering whether a student is suited to a particular social context—and vice versa—in addition to making placements on the basis of knowledge or interest.

Schooling May Undermine Learning at Work

We heard numerous concerns from adults at all sites that schools do not instill an appropriate orientation toward learning and working. In order for students to learn on the job, they must interact within the social setting to learn their tasks with the goal of eventually carrying them out on their own. Students must know when to ask questions or take the initiative, have the confidence to solve problems, and understand how to work with others. Students must take responsibility for their own learning. Unfortunately, we heard numerous stories that schooling does quite the opposite. Students told us that learning at school means listening, not asking questions. It means working alone, not with other students. It means asking the teacher what to do, not figuring it out for oneself. In school, a good excuse is all you need to get out of doing something.

This situation leads to two very different implications. One obvious remedy is to simply provide WBL experiences for more students because that work experience will provide the best opportunities for students to learn how to learn at work. Indeed, WBL proponents may argue that this study clearly confirms the value of incorporating WBL into high school programs. The problem, then, is one of scaling up. Since job shadowing or other less intensive experiences may not have the desired payoff, how can long-term, intensive school-supervised WBL be offered to more students?

An alternative remedy is to improve school-based teaching to produce active, engaged learners who can work alone and with others, and who will be better prepared to learn how to learn at work. Research shows that it is possible to teach problem solving, teamwork, and other work-related skills and attitudes in high school classrooms, provided they are designed around authentic project work and supported by appropriate teaching methods (Stasz et al., 1990, 1993). But this remedy may require significant changes in curriculum, assessment, teacher preparation, and staff development. Like the previous remedy, this one also entails a long-term, costly school reform strategy.

Who Teaches at Work?

The WBL sites in this study were quite different with respect to teaching strategies and expertise. Students at the SBE and the university laboratory generally found experienced, skilled teachers, who paid much attention to students' personal needs in designing different learning activities. It is perhaps not surprising to find skilled teachers at the two school-based worksites.

In contrast, at the nonschool worksites where TCAP students intern, the basic teaching strategy was "show and tell." The company with a specific training philosophy also offered more educative experiences than the firm that preferred to hire skills, not train them. The mentors or supervisors at the TCAP worksites had no particular experience teaching high school students and did not receive any special training. While the TCAP, and others we have studied, attempt to incorporate some form of mentor training, programs rarely require that mentors or supervisors attend such training as a condition of participation. The mentors participating in TCAP did not necessarily attend the training sessions. In addition to training, employers must commit human resources to coordinate, manage, coach, and mentor youth in the workplace. Yet many programs do not have written agreements that specify the qualifications of mentors or even articulate the employer's responsibility to the program and student. And we have found that even if such agreements exist on paper, they may or may not be monitored in any systematic way.

It is curious that educators and the public often express concern when teachers can teach with emergency credentials or with little formal knowledge of the subject matter, but seem oblivious to the qualifications of the adults who teach students at work. Our study suggests that much more serious attention be paid to providing appropriate training to worksite mentors and to monitoring their performance as teachers.

Maybe Smaller Is Just Better

These three different programs have one thing in common—all enroll a small number of students. In 1995, each TCAP academy had about 60 students in schools where the student body numbers over 2,000. The MMHS is a magnet school with about 220 students from grades 10-12. SBE can accommodate 40 students in a high school with an enrollment of 2,500. In each case, these programs have a dedicated number of teachers, plus additional staff. Some have dedicated counselors. All have a staffperson who deals with the WBL portion of the program. Someone is paying attention to every student enrolled in these programs. An important question, which we cannot examine but only raise here, is the extent to which the small size and focus of these programs contributes to any positive outcomes. It may be that while WBL or industry exploration provides a focus for the program's activities, the real power in the program, from the students' perspective, is being part of a small group that includes caring adults. The "treatment," per se, may not matter as much as the fact that there is one.

Must School and Work Be Connected for WBL To Have Value?

This study corroborates other research on school-to-work programs in finding that school and work are often only loosely connected and that connections are difficult to establish (Hershey et al., 1997; OTA, 1995). But the study also shows that students learn many valuable lessons and develop many skills even though connections between school and work are weak. Students at the science lab, for example, have the opportunity to learn a much higher level of science than can be offered in their high school program. Their WBL experience gave them excellent preparation for college and may even help them be more employable. The desire on the part of school staff to have students compete in the science fair, only placed constraints on the WBL experience. But as the mentor in the lab pointed out, it would be extremely difficult for any science teacher to include the specialized topic of neuromuscular research in the science curriculum or to blend it with the other internships open to students. Does the lack of connection to science class—or for that matter, English, chemistry, or math—make the work experience less valuable to students? Seen in this light, explicitly connecting school-based learning and WBL may not always be a desirable goal.

Similarly, the SBE was connected to school primarily through its location on the high school campus. Students appear to benefit greatly, without any strong connection to the school-based curriculum. Although this school-based enterprise did not provide the same opportunities for learning about work as a real work setting might, it clearly supports learning a variety of skills in addition to enhancing academic achievement.

Perhaps the effort to connect school and work is misplaced. Perhaps the real power of the WBL concept is pedagogical—authentic work experiences should give students opportunities to apply knowledge in useful contexts, thereby gaining a deeper understanding of both their abilities and the opportunities they can create for themselves through experience and/or education. By this criteria, all the programs arguably have value, whether they explicitly connect to school or not. By focusing on how learning happens, rather than where it happens—at school or at work—and how the two are connected, perhaps we can better determine what value WBL provides over other learning opportunities. In the end, learning is a personal, developmental transformation, so we must pay attention to whether or not that transformation occurs, as well as to the context that will make such a transformation possible. It is this context that educators and teachers, in and out of schools, have the most ability to shape.

REFERENCES

Berryman, S. (1992). Apprenticeship as a paradigm for learning. In *Youth apprenticeship in America: Guidelines for building an effective system* (pp. 25-39). Washington, DC: William T. Grant Foundation Commission on Youth and America's Future.

Berryman, S., & Bailey, T. (1992). *The double helix of education and the economy* (Executive Summary). New York: Teachers College, Columbia University, Institute on Education and the Economy.

Bodilly, S., Ramsey, K., Stasz, C., & Eden, R. (1992). *Integrating academic and vocational education: Lessons from eight early innovators* (NCRVE Document No. MDS-287; RAND Document No. R-4265-NCRVE/UCB). Berkeley and Santa Monica: National Center for Research in Vocational Education, University of California at Berkeley, and RAND.

Bragg, D. D., Hamm, R. E., & Trinkle, K. A. (1995). *Work-based learning in two year colleges in the United States* (MDS-721). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Burstein, L., McDonnell, L. M., Van Winkle, J., Ormseth, T. H., Mirocha, J., & Guiton, G. (1995). *Validating national curriculum indicators* (MR-658-NSF). Santa Monica: RAND.

Collins, A., Brown, J., & Newman, S. (1989). Cognitive apprenticeship: Teaching the craft of reading, writing, and mathematics. In L. Resnick (Ed.), *Knowing, learning, and instruction: Essays in honor of Robert Glaser* (pp. 453-494). Hillsdale, NJ: Lawrence Erlbaum Associates.

Council of Chief State School Officers (CCSSO). (1994). *Using youth and apprenticeship to improve the transition to work*. Washington, DC: Author.

Goldberger, S., Kazis, S., & O'Flanagan, M. K. (1994). *Learning through work: Designing and implementing quality worksite learning for high school students*. New York: Manpower Demonstration Research Corporation.

Greenberger, E., & Steinberg, L. (1986). *When teenagers work: The psychological and social costs of adolescent employment.* New York: Basic Books.

Grubb, W. N., & Badway, N. (1995). *Linking school-based and work-based learning: The implications of La Guardia's co-op seminars for school-to-work programs* (MDS-1046). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Hackman, J. R., & Oldham, G. R. (1980). *Work redesign.* Menlo Park, CA: Addison Wesley.

Hamilton, M. A., & Hamilton, S. F. (1997). *Learning well at work: Choices for quality.* Washington, DC: National School-to-Work Office.

Hart-Landsberg, S., Braunger, J., Reder, S., & Cross, M. (1992). *Learning the ropes: The social construction of work-based learning* (MDS-413). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Hershey, A., Hudis, P., Silverberg, M., & Haimson, J. (1997). *Partners in progress: Early steps in creating school to work systems. Executive summary.* Washington, DC: U.S. Department of Education.

Jacobs, J. (1995). *The School to Work Opportunities Act of 1994: A guide to the law and how to use it.* Washington, DC: Center for Law and Education.

Kinneavy, J. L. (1971). *A theory of discourse: The aims of discourse.* New York: W. W. Nortong.

Kolb, D. A. (1984). *Experiential learning.* Englewood Cliffs, NJ: Prentice-Hall.

Lave, J. (1991). Situating learning in communities of practice. In L. Resnick, J. Levine, & S. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 63-82). Washington, DC: American Psychological Association.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation.* Cambridge, England: Cambridge University Press.

Martin, L., & Beach, K. (1992). *Technical and symbolic knowledge in CNC machining: A study of technical workers of different backgrounds* (MDS-146). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Moore, D. T. (1980). Having it BOTH ways: The reproduction and transformation of schooling. *Anthropology and Education Quarterly, 11*(3), 153-172.

Moore, D. T. (1981). Discovering the pedagogy of experience. *Harvard Educational Review, 51*(2), 286-300.

National Center on Educational Quality of the Workforce (NCEQW). (1995). *EQW national employer survey (EQW-NES).* Philadelphia: University of Pennsylvania.

Newmann, F., & Wehlage, G. (1995). *Successful school restructuring.* Madison: University of Wisconsin–Madison, Center on Organization and Restructuring of Schools.

Newmann, F., Secada, W., & Wehlage, G. (1995). *A guide to authentic instruction and assessment: Vision, standards, and scoring.* Madison: University of Wisconsin–Madison, Center for Education Research.

Nielsen Andrew, E. (Ed.). (1996). *As teachers tell it: Implementing all aspects of the industry. The case studies* (MDS-885A). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Office of Technology Assessment (OTA), U.S. Congress. (1995). *Learning to work: Making the transition from school to work* (OTA-EHR-637). Washington, DC: U.S. Government Printing Office.

Pauley, E., Kopp, H., & Haimson, J. (1994). *Home-grown lessons: Innovative programs linking work and high school*. New York: Manpower Demonstration Research Corporation.

Pedraza, R. A., Pauley, E., & Kopp, H. (1997). *Home grown progress: The evolution of innovative school-to-work programs*. New York: Manpower Demonstration Research Corporation.

Perkins, D., Jay, E., & Tishman, S. (1993). New conceptions of thinking: From ontology to education, *Educational Psychologist*, *28*(1), 67-85.

Phelps, L. A., Scribner, J., Wakelyn, D., & Weis, C. (1996). *Youth apprenticeship in Wisconsin: A stakeholder assessment*. Madison: State of Wisconsin Department of Workforce Development.

Prawat, R. S. (1989). Promoting access to knowledge, strategy, and dispositions in students: A research synthesis, *Review of Educational Research*, *59*(1), 1-41.

Raizen, S. (1989). *Reforming education for work: A cognitive science perspective* (MDS-024). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Resnick, L. (1991). Shared cognition: Thinking as social practice. In L. Resnick, J. Levine, & S. Teasley (Eds.), *Perspectives on socially shared cognition* (pp. 1-20). Washington, DC: American Psychological Association.

Rogoff, B., & Charajay, P. (1995). What's become of research on the cultural basis of cognitive development? *American Psychologist*, *50*(10), 859-877.

Scribner, S. (1984). Studying working intelligence. In B. Rogogg & J. Lave (Eds.), *Everyday cognition: Its development in social context* (pp. 9-40). Cambridge, MA: Harvard University Press.

Scribner, S. (1988). *Head and hand: An action approach to thinking* (Occasional Paper No. 3). New York: National Center on Education and Employment.

Secretary's Commission on Achieving Necessary Skills (SCANS). (1991). *What work requires of schools.* Washington, DC: U.S. Department of Labor.

Spradley, J. P. (1980). *Participant observation*. New York: Holt.

Stasz, C. (1995). *The economic imperative behind school reform: A review of the literature* (DRU-1064-NCRVE/UCB). Santa Monica, CA: RAND.

Stasz, C., & Brewer, D. (in press). Work-based learning: Student perspectives on quality links to school. *Educational Evaluation and Policy Analysis.*

Stasz, C., McArthur, D., Lewis, M., & Ramsey, K. (1990). *Teaching and learning generic skills for the workplace* (NCRVE Document No. MDS-066; RAND Document No. R-4004-NCRVE/UCB). Berkeley and Santa Monica: National Center for Research in Vocational Education, University of California at Berkeley, and RAND.

Stasz, C., Ramsey, K., Eden, R., DaVanzo, J., Farris, H., & Lewis, M. (1993). *Classrooms that work: Teaching generic skills in academic and vocational settings*, MR-169-NCRVE/UCB. Santa Monica, CA: RAND.

Stasz, C., Ramsey, K., Eden, R., Melamid, E., & Kaganoff, T. (1996). *Workplace skills in practice: Case studies of technical work* (NCRVE Document No. MDS-773; RAND Document No. MR-722-NCRVE/UCB). Berkeley and Santa Monica: National Center for Research in Vocational Education, University of California at Berkeley, and RAND.

Stern, D. (1991). *Learning through work.* Unpublished manuscript. Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

Stern, D. (1992). *School to work programs and services in secondary schools and two-year public postsecondary institutions.* Berkeley: University of California, School of Education.

Stern, D. (1994, November 7-8). *Human resource development in a learning-based economy*. Paper prepared for OECD conference "Employment and Growth in the Knowledge-Based Economy," Copenhagen.

Stern, D., Finkelstein, N., Stone III, J. R., Latting, J., & Dornsife, C. (1995). *School to work: Research on programs in the United States*. Washington, DC: The Falmer Press.

Stern, D., Hopkins, C., Stone III, J. R., & McMillion, M. (1990). Quality of students' work experience and orientation toward work. *Youth and Society*, *22*(2), 263-282.

Stern, D., & Nakata, Y. (1990). Characteristics of high school students' paid jobs, and employment experience after graduation. In D. Stern & D. Eichorn (Eds.), *Adolescence and work: Influences of social structures, labor markets, and culture* (pp. 189-233). Hillsdale, NJ: Erlbaum.

Stone III, J. R., Stern, D., Hopkins, C., & McMillion, M. (1990). Adolescents' perceptions of their work: School supervised and non-school supervised. *Journal of Vocational Education Research*, *15*(2), 31-53.

Urquiola, M., Stern, D., Horn, H., Dornsife, C., Chi., B., Williams, L., Merritt, D., Hughes, K., & Bailey, T. (1997). *School to work, college and career* (MDS-1144). Berkeley: National Center for Research in Vocational Education, University of California at Berkeley.

U.S. Department of Commerce, Bureau of the Census. (1992). *Current population survey*. Washington, DC: Author.

U.S. Department of Education, National Center for Education Statistics. (1992). National Education Longitudinal Study, "Second Follow-Up."

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Wieler, S., & Bailey, T. (1997). Going to scale: Employer participation in school-to-work programs at La Guardia Community College. *Educational Evaluation and Policy Analysis, 19*(2), 123-140.

Yin, R. K. (1981). The case study as a serious research strategy. *Knowledge, Creation, Diffusion, Utilization*, 3, 97-114.

Yin, R. K. (1994). *Case study research: Design and methods* (2nd ed.). Thousand Oaks, CA: Sage.